

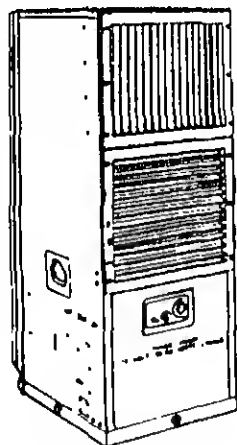


# TECHNICAL MANUAL

## OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

RETURN TO GPO

CONDITIONER, VERTICAL COMPACT  
18,000 BTU/HR, COOLING  
12,000 BTU/HR, HEATING  
VOLT, 3 PHASE, 400 HERTZ  
Y W. HOTTEL, MODEL CV-18-4-08)  
4120-01-089-4054



CHAPTER 1	INTRODUCT
CHAPTER 2	OPERATING INSTRUCT
CHAPTER 3	OPERATOR MAINTEN INSTRUCT
CHAPTER 4	ORGANIZATIONAL MAINTEN INSTRUCT
CHAPTER 5	DIRECT SUPPORT MAINTEN INSTRUCT
CHAPTER 6	GENERAL SUPPORT MAINTEN INSTRUCT
APPENDIX A	REFERE
APPENDIX B	COMPONENTS OF END ITEM
APPENDIX C	MAINTENANCE ALLOCATION C
APPENDIX D	ADDITIONAL AUTHORIZATION
APPENDIX E	EXPENSABLE SUPPLIES MATERIALS
APPENDIX F	MANUFACTURED ITEMS
APPENDIX G	OIAO
	ALPHABETICAL

HEADQUARTERS, DEPARTMENT OF THE ARMY  
18 MAY 1982

This copy is a reprint which includes current  
pages from Change 1.

# The Metric System and Equivalents

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.04 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 deksmeter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

## Weights

1 centigram = 10 milligrams = .16 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigram = .035 ounce  
 1 deksgram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.45 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

## Square Measure

1 sq. centimeter = 100 sq. millimeters = .15  
 1 sq. decimeter = 100 sq. centimeters = 16.  
 1 sq. meter (centarc) = 100 sq. decimeters =  
 1 sq. dekameter (are) = 100 sq. meters = 1.0  
 1 sq. hectometer (hectare) = 100 sq. dekam  
 1 sq. kilometer = 100 sq. hectometers = .38

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .0  
 1 cu. decimeter = 1000 cu. centimeters = 61  
 1 cu. meter = 1000 cu. decmeters = 35.31 c

# Approximate Conversion Factors

To change	To	Multiply by	To change	To
inches	centimeters	2.540	ounce-inches	newton-meters
feet	meters	.305	centimeters	inches
ysrds	meters	.914	meters	foot
miles	kilometers	1.609	meters	yards
square inches	square centimeters	6.451	kilometers	miles
square feet	square meters	.093	square centimeters	square inches
square ysrs	square meters	.836	square meters	square foot
square miles	square kilometers	2.590	square meters	square yards
scres	square hectometers	.406	square kilometers	square miles
cubic feet	cubic meters	.028	square hectometers	acres
cubic ysrs	cubic meters	.785	cubic meters	cubic feet
fluid ounces	milliliters	29.573	cubic meters	cubic yards
pints	liters	.473	milliliters	fluid ounces
quarts	liters	.945	liters	pints
gallons	liters	3.785	liters	quarts
ounces	grams	28.349	liters	gallons
pounds	kilograms	.454	grams	ounces
short tons	metric tons	.907	kilograms	pounds
pound-feet	newton-meters	1.356	metric tons	short tons
pound-inches	newton-meters	.11295		

# Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperatures	°C
----	------------------------	----------------------------	----------------------	----

Operator's Organizational, Direct Support  
and General Support Maintenance Manual

AIR CONDITIONER, VERTICAL COMPACT  
18,000 BTU/HR, COOLING  
12,000 BTU/HR, HEATING  
208 VOLT, 3 PHASE, 400 HERTZ  
(HARVEY W. HOTTEL, MODEL CV-18-4-08)  
4120-01-089-4054

TM 5-4120-344-14, 18 May 1982, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages

Insert pages

----

2-9/2-10

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

**CARL E. VUOLTE**  
*General, United States Army*  
*Chief of Staff*

Official:

**R. L. DILWORTH**

*Brigadier General, United States Army*  
*The Adjutant General*

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Operator's, Unit, Intermediate Direct Support, and Intermediate General Support Maintenance manual for Air Conditioner, Vertical Compact, 18,000 BTU Cool/12,000 BTU Heat, Model CV-20-4-08 (CV-20-4-08)



## WARNING

- Be careful when working with high voltage. Failure to comply can result in serious injury or death.
- Do not use compressed air for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.
- Dry cleaning solvent P-U-680 or P-S-661, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).
- Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector in any situation where skin- or eye-contact is possible. Prevent contact of refrigerant gas with flame or hot metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.
- Escaping refrigerant gas under pressure can cause permanent tissue damage from sudden freezing.
- Polyurethane foam insulation breaks down to form toxic gases when heated to brazing temperature.



OPERATOR'S, ORGANIZATIONAL DIRECT SUPPORT  
AND GENERAL SUPPORT MAINTENANCE MANUAL  
AIR CONDITIONER  
18,000 BTU/HR COOLING  
12,000 BTU/HR HEATING  
(HARVEY E. HOTTEL, MODEL CV-18-4-08)  
(4120-01-089-4054)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

To help improve this manual. If you find any mistakes or if you know of a  
improve the procedures, please let us know. Mail your letter, DA Form  
(Suggested Changes to Publications and Blank Forms), or DA Form 2028-2 located  
back of this manual direct to: Commander, US Army Troop Support and Avia  
l Readiness Command, ATTN: DRSTS-MPSD, 4300 Goodfellow Blvd., St. Louis,  
A reply will be furnished directly to you.

TABLE OF CONTENTS

	Page
1. INTRODUCTION	1-1
on I. General Information .....	1-1
on II. Equipment Description .....	1-3
on III. Technical Principles of Operation ....	1-6
2. OPERATING INSTRUCTIONS	2-1
on I. Description and Use of Operator's Controls and Indicators .....	2-1
on II. Preventive Maintenance Checks and Services (PMCS) .....	2-3
on III. Operation Under Usual Conditions .....	2-5
on IV. Operation Under Unusual Conditions ...	2-8
3. OPERATOR'S MAINTENANCE INSTRUCTIONS	3-1
on I. Lubrication Instructions .....	3-1
on II. Troubleshooting .....	3-1



# TABLE OF CONTENTS -Continued

		Page
R 4.	ORGANIZATIONAL MAINTENANCE INSTRUCTIONS	4-1
ion	I. Repair Parts, Special Tools, TMDE, and Support Equipment .....	4-1
ion	II. Service Upon Receipt of Equipment ....	4-1
ion	III. Preventive Maintenance Checks and Services (PMCS) .....	4-10
ion	IV. Troubleshooting .....	4-19
ion	V. Maintenance Procedures .....	4-21
ion	VI. Preparation for Storage or Shipment ..	4-122
R 5.	DIRECT SUPPORT MAINTENANCE INSTRUCTIONS	5-1
ion	I. General .....	5-1
ion	II. Troubleshooting .....	5-1
R 6.	GENERAL SUPPORT MAINTENANCE INSTRUCTIONS	6-1
ion	I. General .....	6-1
ion	II. Maintenance Procedures.....	6-1
DIX	A. REFERENCES .....	A-1
DIX	B. COMPONENTS of END ITEM LIST .....	B-1
DIX	C. MAINTENANCE ALLOCATION CHART .....	C-1
DIX	D. ADDITIONAL AUTHORIZED LIST .....	D-1
DIX	E. EXPENDABLE SUPPLIES AND MATERIALS LIST .....	E-1
DIX	F. MANUFACTURED ITEMS LIST .....	F-1
ARY	.....	GLOSSARY
BETICAL INDEX	.....	INDEX 1

# CHAPTER 1

## INTRODUCTION

### Section 1. GENERAL INFORMATION

COPE.

This manual covers Air Conditioner, Model CV-18-4-08 (figure 1-1), manufactured by Harvey W. Hottel, Inc. The air conditioner cools or heats air for electronic equipment, and the comfort of operating personnel.

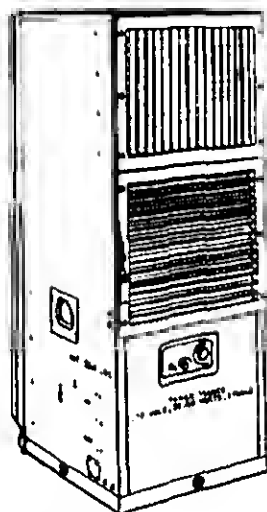


Figure 1-1. Air Conditioner

### MAINTENANCE FORMS, RECORDS, AND REPORTS.

The Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

### DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Procedures for destroying Army materiel to prevent enemy use are listed in TM 750-244-3.

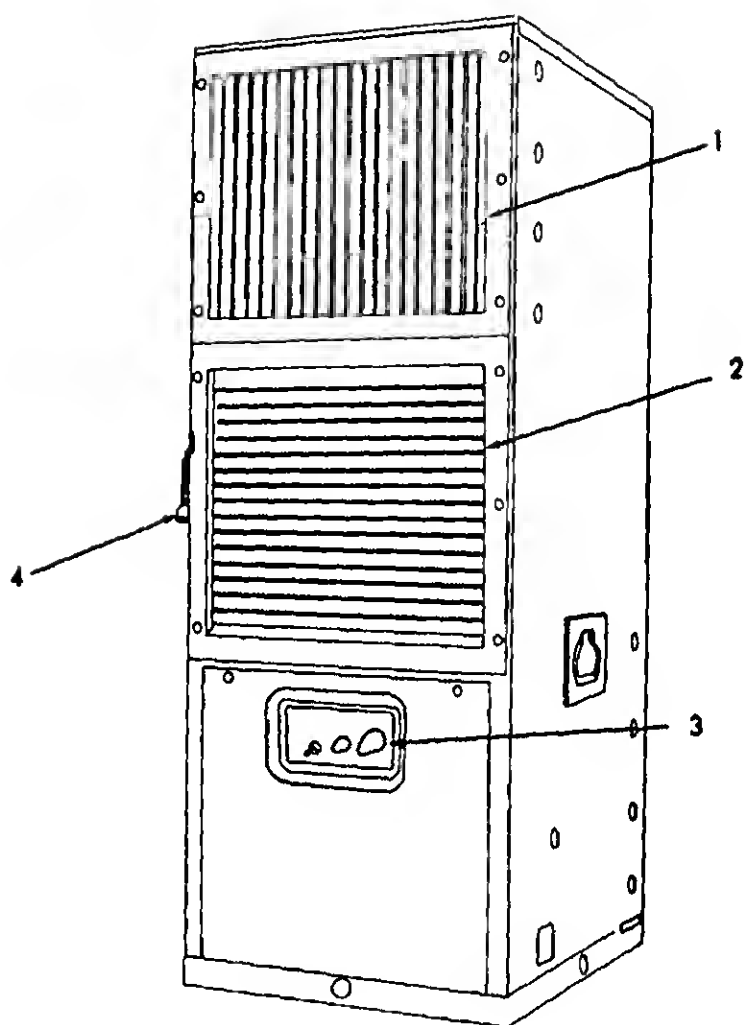


Capabilities and features of the air conditioner are:

- a. Air cooled.
- b. Installed in a vertical position.
- c. Electric motor driven.
- d. Runs continuously even under varying load conditions.
- e. Produces 18,000 BTU/HR of cooling.
- f. Produces 12,000 BTU/HR of heat.
- g. Contains all operating controls and parts.
- h. Adaptable to remote control.
- i. Adaptable to chemical and biological filters.

#### LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Major components for operational purposes are shown and described in figure 1-2.



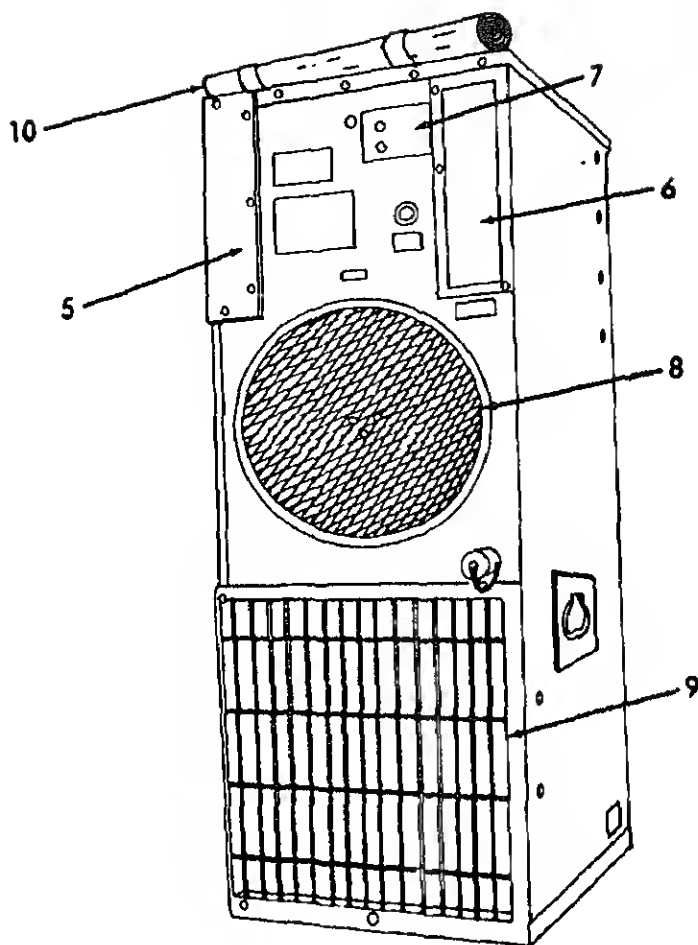
Front View

Discharge Grille (1). Cooled or heated air is blown out of the grille.

Intake Air Grille Damper (2). Input air from inside is pulled through the grille prior to being heated or cooled.

Control Panel (3). Used to select cooling or heating, temperature, and fan speed.

Air Damper Door Control Chain (4). This chain when pulled opens the air intake from inside to outside prior to heating or cooling.



Rear View

al, Biological Access Cover (5). Filter is installed to  
g if needed.

Air Screen (6). Input for fresh outside air.

es (7). High and low pressure cutout switches.

). Draws air through condenser coils.

ser Coil Guard (9). Protection for condenser (located b  
(e)).

s Cover (10). External protection from weather condition  
s not in use.

## -10. DIFFERENCES BETWEEN MODELS.

This manual covers only the CV-18-4-08 Model air conditioner.

## -11. EQUIPMENT DATA.

### GENERAL

Description	Air Conditioner, Vertical,
Manufacturer	Harvey W. Hottel, Inc.
Model	CV-18-4-08
National Stock Number	4120-01-089-4054

### DIMENSIONS and WEIGHT

Length	20 in (508 mm)
Width	17 in (431.8 mm)
Height	46 in (1168.4 mm)
Weight	247 lbs (112.14 kg)

### SPECIFICATIONS

Capacity (Cooling)	18,000 BTU/HR
Capacity (Heating)	12,000 BTU/HR
Volts	208
Hertz	400
Phase	3

## Section III. TECHNICAL PRINCIPALS OF OPERATION

### 1-12. GENERAL.

The air conditioner is a self-contained, air cooled, electric motor driven unit. The unit produces 18,000 BTU/HR for cooling and 12,000 BTU/HR for heating.

### 1-13. COOLING.

Cooling is obtained when the selector switch is turned to COOL and the temperature control is set below room temperature. This starts the unit. A fan motor and compressor will be running and cool air is felt. If cool air is not felt move the temperature control to a lower setting.

### 1-14. VENTILATE.

Ventilation is obtained when the selector switch is turned to VENTILATE. This starts the unit. A fan motor will be running and fresh air is obtained. Moving the air intake damper control increases or decreases the amount of air.

LOW HEAT.

Low heat is obtained when the selector switch is turned to the "LOW" position and the temperature control is set above room temperature. The unit. A fan motor will be running and heat will be felt. If it is enough for cool days. If heat is not felt move the temperature control. The heat obtained is 6,000 BTU/HR.

HIGH HEAT.

High heat is obtained when the selector switch is turned to the "HIGH" position and the temperature control is set above room temperature. The unit. A fan motor will be running and heat will be felt. If it is for cold days. If heat is not felt move the temperature control. The heat obtained is 12,000 BTU/HR.



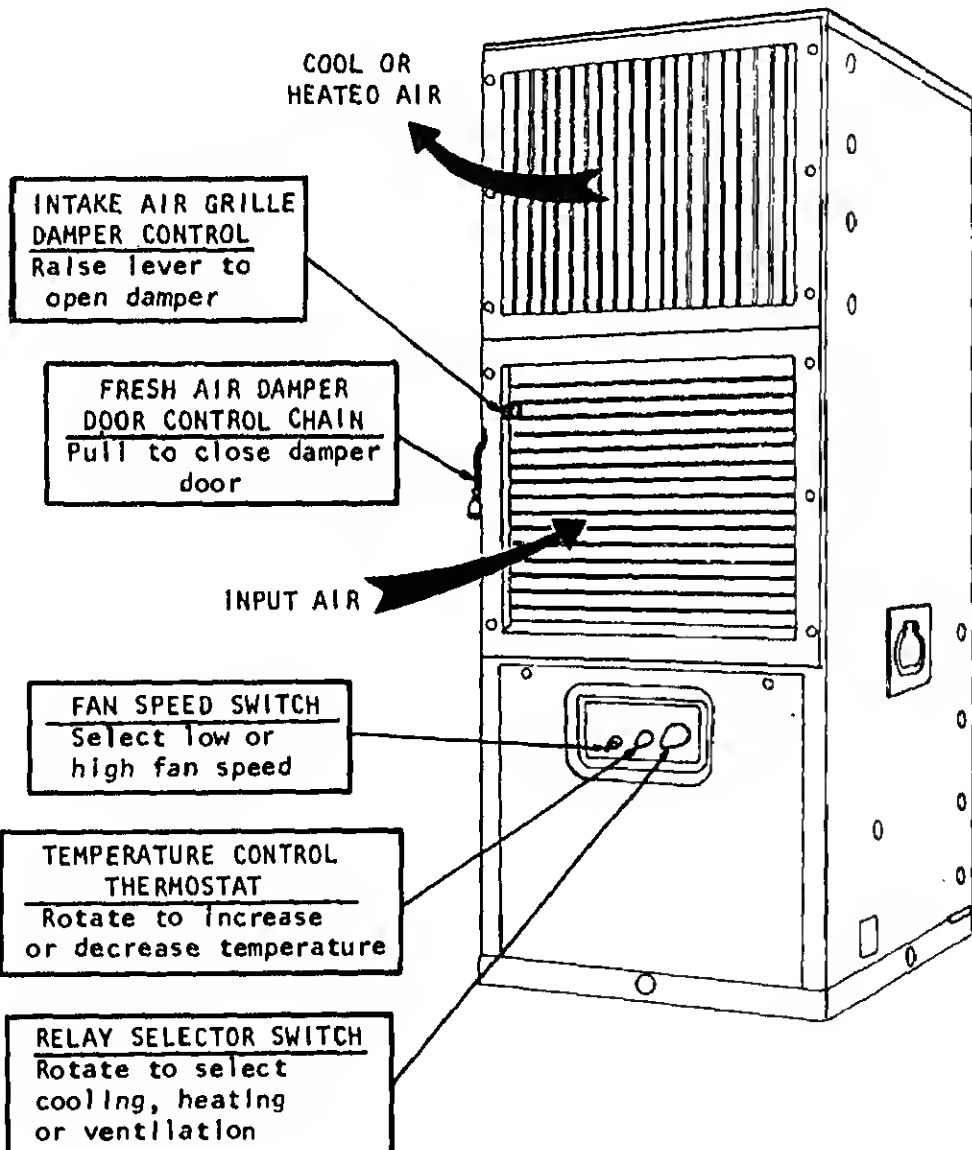


## CHAPTER 2

### OPERATING INSTRUCTIONS

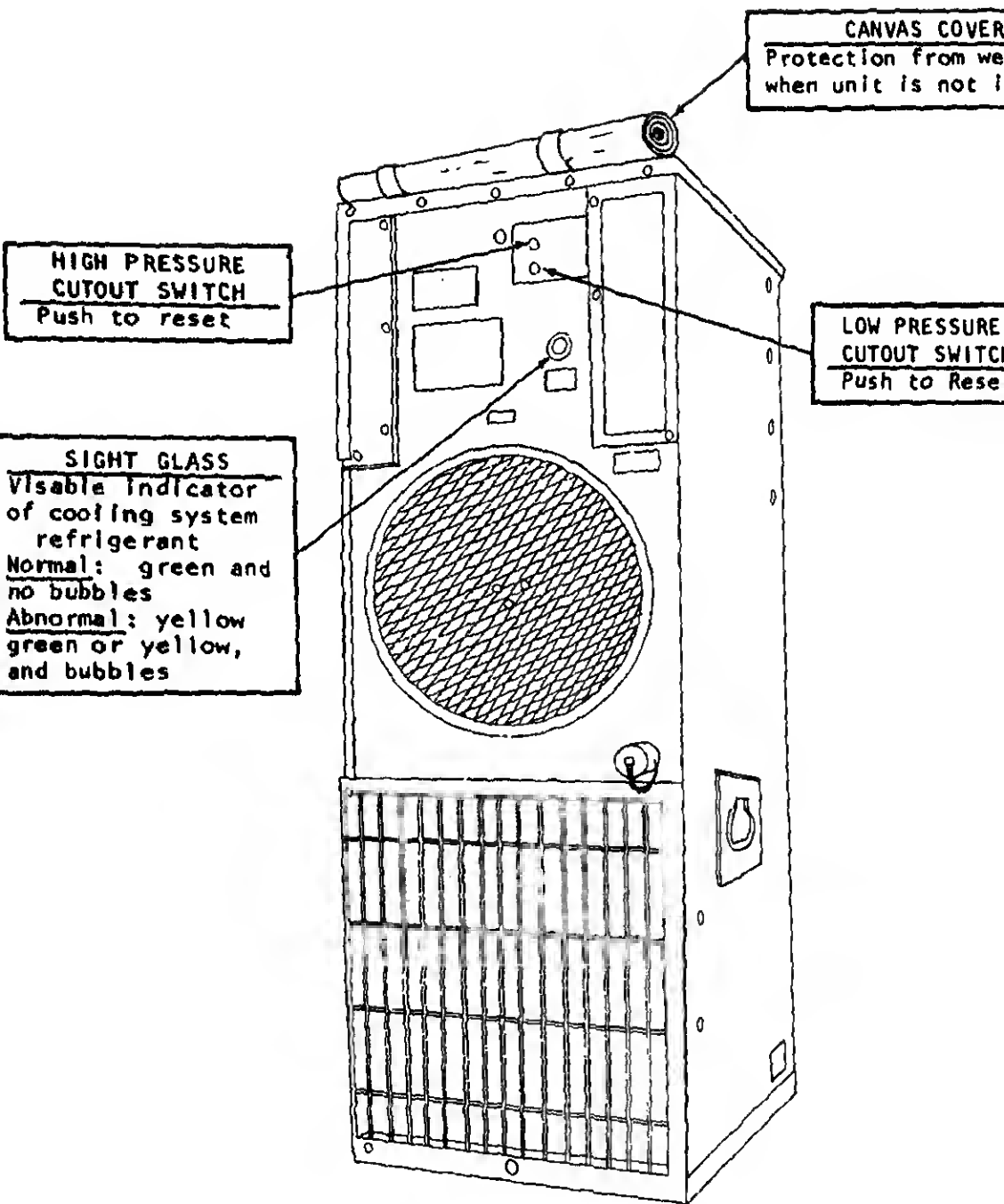
#### I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.

Figure 2-1 shows the location of the operator's controls. Before operating the air conditioner make sure you know the location and use of all controls.



FRONT VIEW

Figure 2-1. Operating Controls (Sheet 1 of 2)



REAR VIEW

GENERAL.

- a. Preventative Maintenance Checks and Services (PMCS, are to be done to be sure the air conditioner is ready to times. These checks and services help you find and fix defects the air conditioner is damaged or fails.
- b. Item numbers in the first column of Table 2-1 are the in which things are to be done. Column two "Interval" to do them and who should do them.
- c. If minor defects are found when the air conditioner take notes on what they are. Fix them or have them fixed have stopped running the air conditioner.

NOTE

While the air conditioner is running, if any defect develops that you think will damage the air conditioner, stop it at once.

- d. Record all defects and steps taken to fix them on DA (Equipment Inspection and Maintenance Work Sheet) as soon as possible.

Before you operate: Always keep in mind the WARNINGS and CAUTIONS located on the inside front cover. Perform your before (B) PMCS.

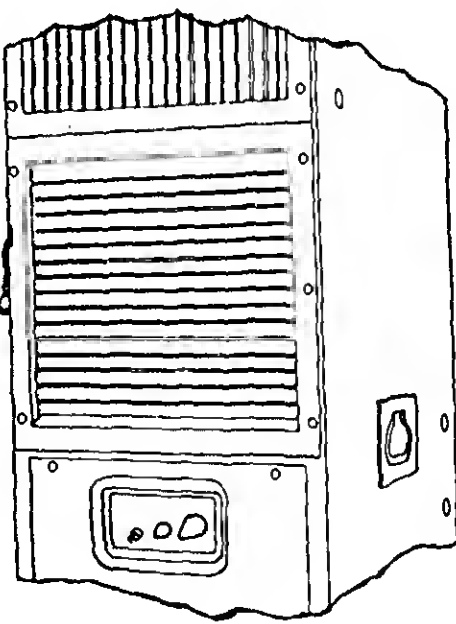
Table 2-1. Preventive Maintenance Checks and Services

## NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before operation  
D - During

A - After operation  
W - Weekly

Item Number	Interval				ITEM TO BE INSPECTED PROCEDURE Check for and have repaired or adjusted as necessary.	Equipment Ready/Available If:
	Operator Daily					
	B	D	A	W		
1	•				<p>CANVAS COVER .... Inspect for tears, mildew, or rot. Inspect turn-lock eyelets and fasteners for damage. If damage cannot be repaired install a new canvas cover.(See para 4-8.)</p> <p>FRONT</p>  <p>FRESH AIR DAMPER</p>	
2	•				<p>FRESH AIR DAMPER .... Pull chain to close damper door. Release chain to open damper door.</p>	

## . GENERAL.

The instructions in this section are for personnel who operate the air conditioner. How the air conditioner is started and operated under normal weather conditions is described.

## . STARTING THE EQUIPMENT

Before you operate. Always keep in mind the CAUTIONS and WARNINGS.

### CAUTION

Before turning on any of the air conditioner's operating controls, make sure that the fabric cover is rolled up and secured, and that evaporator intake and discharge grilles are fully open.

To start the air conditioner refer to figure 2-2 and section 2-2. Then make the settings in table 2-2.

### CAUTION

Do not perform the following operations until at least four hours after power has been connected to the air conditioner if it has been stored at below freezing temperatures within the past 24 hours. If knocking or pounding noises are heard when the compressor is started, shut down at once. Leave power connected to the unit, and wait an additional two hours before attempting another start.

## . STOPPING THE EQUIPMENT.

Place the rotary selector switch as shown in figure 2-2 in the STOP position.

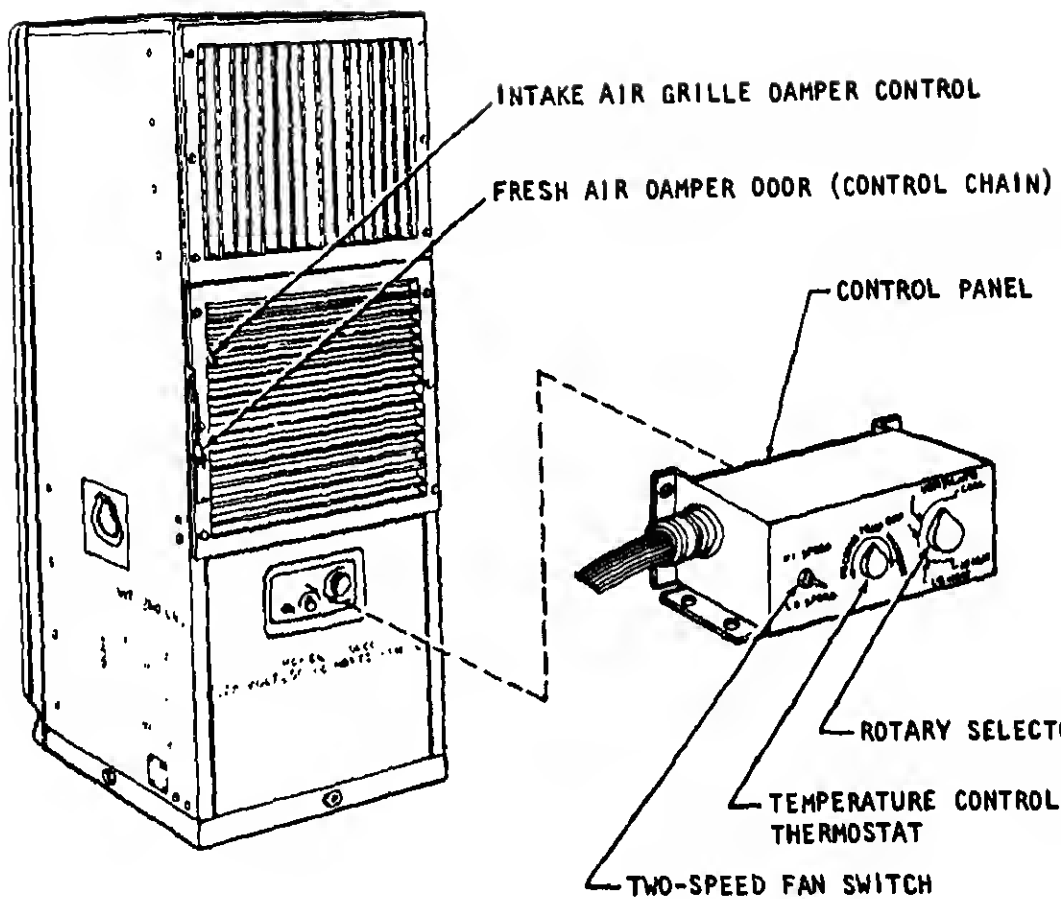


Figure 2-2. Operating the Air Conditioner.

Table 2-2. Operating Control Settings

Mode of air conditioning selected	Temperature Control Thermostat Setting	Intake air grille dampers	Fresh air dampers	Room position
g - 100% recircu- air	Desired temperature	Open	Closed	CO
g - with fresh air	Desired temperature	Partially closed*	Open	CO
g - with fresh air drawn th CBR filter (or air con- tained)	Desired temperature	Open	Closed	CO
g - 100% recircu- air	Desired temperature	Open	Closed	LO H
g - with fresh air	Desired temperature	Partially closed*	Open	LO H
g - with fresh air drawn th CBR filter (or air con- tained)	Desired temperature	Open	Closed	LO H
ation - maximum r air	Any	Closed	Open	VE

Partial closing of the intake air grille dampers causes a greater portion of the total air flow to be drawn from the outside.

To achieve maximum, cooling, heating, or ventilation, the two-speed control should be set on Hi Speed.



## GENERAL.

This section contains instructions for operation of the equipment under the following conditions: extreme cold, extreme heat, dusty areas, rainy or humid conditions, salt water areas, and high altitudes.

### OPERATION IN EXTREME COLD.

The air conditioner is designed to operate in temperatures down to  $50^{\circ}\text{F}$  ( $-45^{\circ}\text{C}$ ). At extremely low temperatures, extra care should be taken to reduce heat loss of the enclosure, by weather-stripping doors and doors, insulating surfaces exposed to the outside, and reducing the amount of outside air drawn in through the fresh air vent of the air conditioner. Do not disturb wiring during extremely cold weather. Wire and insulation become brittle, and are easily broken.

### OPERATION IN EXTREME HEAT.

The air conditioner is designed to operate in temperatures up to  $120^{\circ}\text{F}$  ( $49^{\circ}\text{C}$ ). At extremely high temperatures, extra care should be taken to reduce the cooling load of the enclosure by checking openings such as doors and windows to be sure that they are tightly closed, using window shades to shut out direct rays of the sun, limiting the use of electric lights and other heat producing equipment; and limiting the introduction of outside air through the fresh air damper of the unit.

### OPERATION IN DUSTY OR SANDY AREAS.

Sand and dust can seriously reduce the efficiency of the air conditioner by obstructing the air filter and reducing airflow. Clean the air filter daily, if necessary to provide unobstructed airflow and maintain the volume of air drawn in through the fresh air damper. Regular cleanings should be made to increase the frequency of cleaning the air filter, the air eliminator and checking drainage from the drip pan and the condenser. Keep the canvas cover zipped closed when the air conditioner is not in use.

### OPERATION UNDER RAINY OR HUMID CONDITIONS.

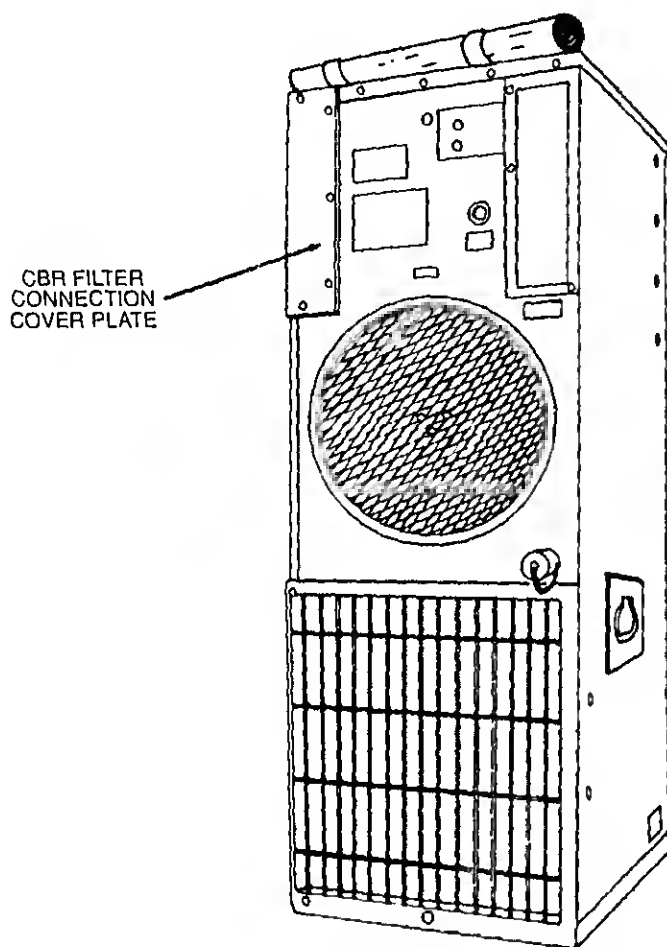
The air conditioner is designed to be exposed to the elements. It is reasonably weatherproof. However, during periods of extreme rain, windy weather, the canvas cover should be closed when the air conditioner is not in use. The canvas cover should be opened during dry weather conditions, to permit the interior to dry out.

### OPERATION IN SALT WATER AREAS.

To prevent the accumulation of salt on exposed surfaces, the canvas cover should be kept closed when the air conditioner is not in use. Exposed areas should be spray-rinsed or sponged with clean water periodically to remove salt encrustations.

## OPERATION UNDER EMERGENCY CONDITIONS

Chemical, biological, radiological (CBR) hazard. This unit has provisions for connection to an existing source. Should it be necessary to operate in conditions requiring use of CBR filtration equipment, see instructions for your shelter or facility installation.



CBR Filter Connection Location

The following are general suggestions and do not apply if they conflict with instructions for your shelter or facility installation.

- a) The fresh air damper (door) should be closed, the opening should be covered with a suitable material to make it air tight.
- b) Fresh air damper (door) chain may be taped over to prevent damper from being opened.
- c) The conditioned air inlet louvers should be adjusted (partially or completely) closed in conjunction with the CBR filter intake volume. This will cause a more positive pressure on inside of shelter or enclosure and keep air from being drawn in other than through the CBR filter.

**Power conservation.** During periods when full 208 volt, 3 phase power is in critically short supply, if power cannot be turned off completely, it should be operated in VENTILATE mode only.



# OPERATOR MAINTENANCE INSTRUCTIONS

## Section I. LUBRICATION INSTRUCTIONS

### GENERAL.

The air conditioner does not require lubrication.

## Section II. TROUBLESHOOTING

### GENERAL.

The table lists the common malfunctions which you may find during operation or maintenance of the air conditioner or it's components. You should perform the tests/inspections and corrective actions listed.

This manual cannot list all malfunctions that may occur, or inspections and corrective actions. If a malfunction is found or is not corrected by listed corrective actions, notify your supervisor.

Table 3-1. Operator Troubleshooting

---

FUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

Air conditioner fails to operate (all circuits inoperative)

Refer to Organizational Maintenance.

Table 3-1. Operator Troubleshooting - Continued

MALFUNCTION

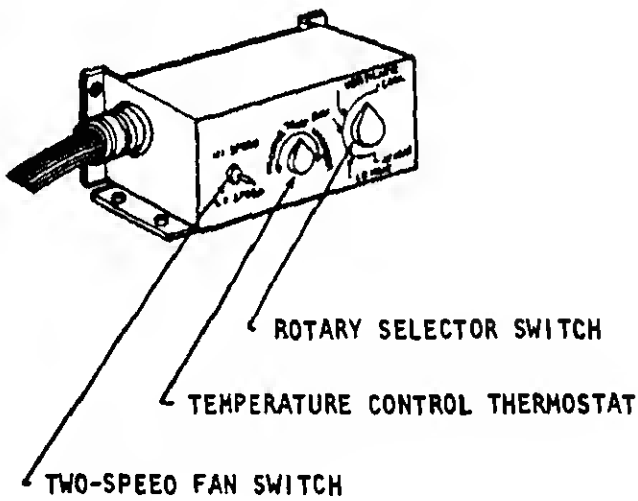
TEST OR INSPECTION

CORRECTIVE ACTION

2. Insufficient or no cooling.

Step 1. Temperature Control thermostat and/or rotary switch improperly set.

Reset controls (para 2-4).



Step 2. Two-speed fan switch improperly set.

Move to Hi-Speed setting (para 2-4).

Table 3-1. Operator Troubleshooting - Continued

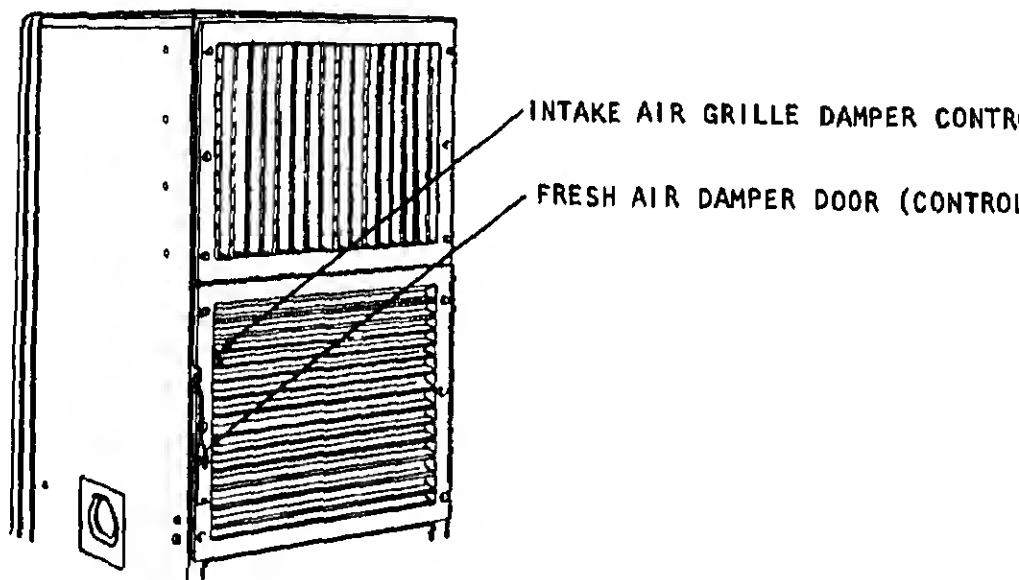
ACTION

TEST OR INSPECTION

CORRECTIVE ACTION

Step 3. Improperly adjusted or closed intake air grille and fresh air damper door control intake.

Adjust intake air grille and fresh air damper door (control).



Step 4. Low refrigerant charge indicated by bubbles in sight glass.

Check for abnormal condition of refrigerant in sight glass after air conditioner has been in cooling operation for at least twenty minutes. If low charge is observed, refer condition to Direct Support Maintenance.

MALFUNCTION

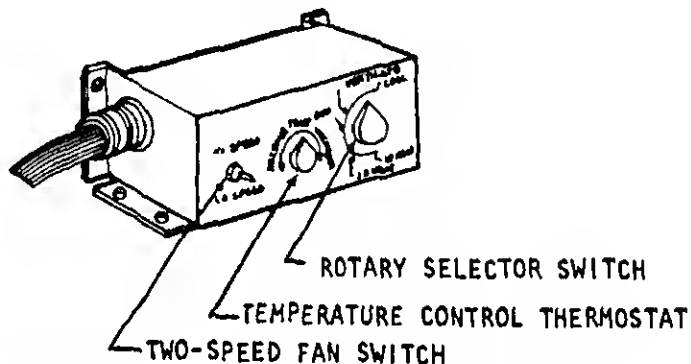
TEST OR INSPECTION

CORRECTIVE ACTION

3. Insufficient or no heating capacity.

Step 1. Temperature control thermostat and/or rotary switch improperly set.

Reset controls (para 2-4).

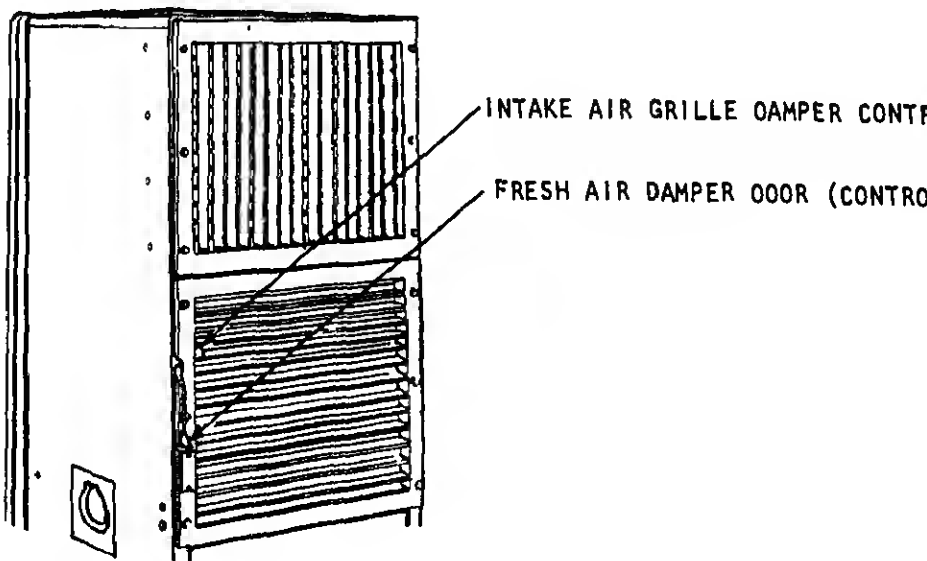


Step 2. Two-speed fan switch improperly set.

Move to Hi-Speed setting(para 2-4).

Step 3. Air movement over evaporator insufficient.

Adjust intake air grille and fresh air damper door (para 2-4).



CTION

EST OR INSPECTION

CORRECTIVE ACTION

tep 4. Other causes.

Refer other causes to organizational and direct support  
maintenance personnel.





tion I. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT.

## GENERAL.

Repair parts are listed and illustrated in TM 5-4120-344. Special tools are required for maintenance of the equipment. Test equipment, and diagnostic equipment (TMDE) and support equipment and equipment found in any refrigeration shop.

## Section II. SERVICE UPON RECEIPT OF EQUIPMENT

### UNPACKING.

The air conditioner is bolted to the wood shipping pallet. It must be removed when the unit is to be installed in a permanent location. Proceed as follows:

Cut the steel strapping, and carefully remove the wooden pallet and plastic wrapping from the unit.

With the help of at least one assistant, lay the air conditioner on either side, supported by cushioned support blocks.

Remove four bolts securing the shipping pallet to the air conditioner's base plate.

Return the unit to the upright position.

### CHECKING UNPACKED EQUIPMENT.

Check the air conditioner in accordance with the following instructions:

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 138, Damage Report.

Check the equipment against the packing slip to see if the equipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750.

Following requirements and recommendations when installing an air conditioner.

N.

Should be installed (figure 4-1) on a level supporting uniform condensate drainage. If a level surface is not available, the unit may be mounted on an angle not greater than 10° from horizontal. If this type of mounting is unavoidable, the condensate drain to the drain opening in the base plate. Drain plugs are located in the middle of the base plate. Standard 1/2 inch by 14 NPT fittings may be used in place of one or more of these plugs to conduct condensate to an acceptable drainage area. A standard garden hose may be used for this purpose.

Dimensions. An opening 18-1/2 x 14-1/2 inches (47 x 37 inches (124.5 x 94 cm) high is required for the air conditioner. A removable filler plate is provided above the unit to permit ready removal of the top cover.

The air conditioner should be bolted to the mounting base plate. The base plate contains four mounting holes for this purpose. See figure 4-2 for base mounting plan.

The air conditioner must have an unobstructed flow of air in and out of the unit efficiently. This minimizes the cooling load on the unit.

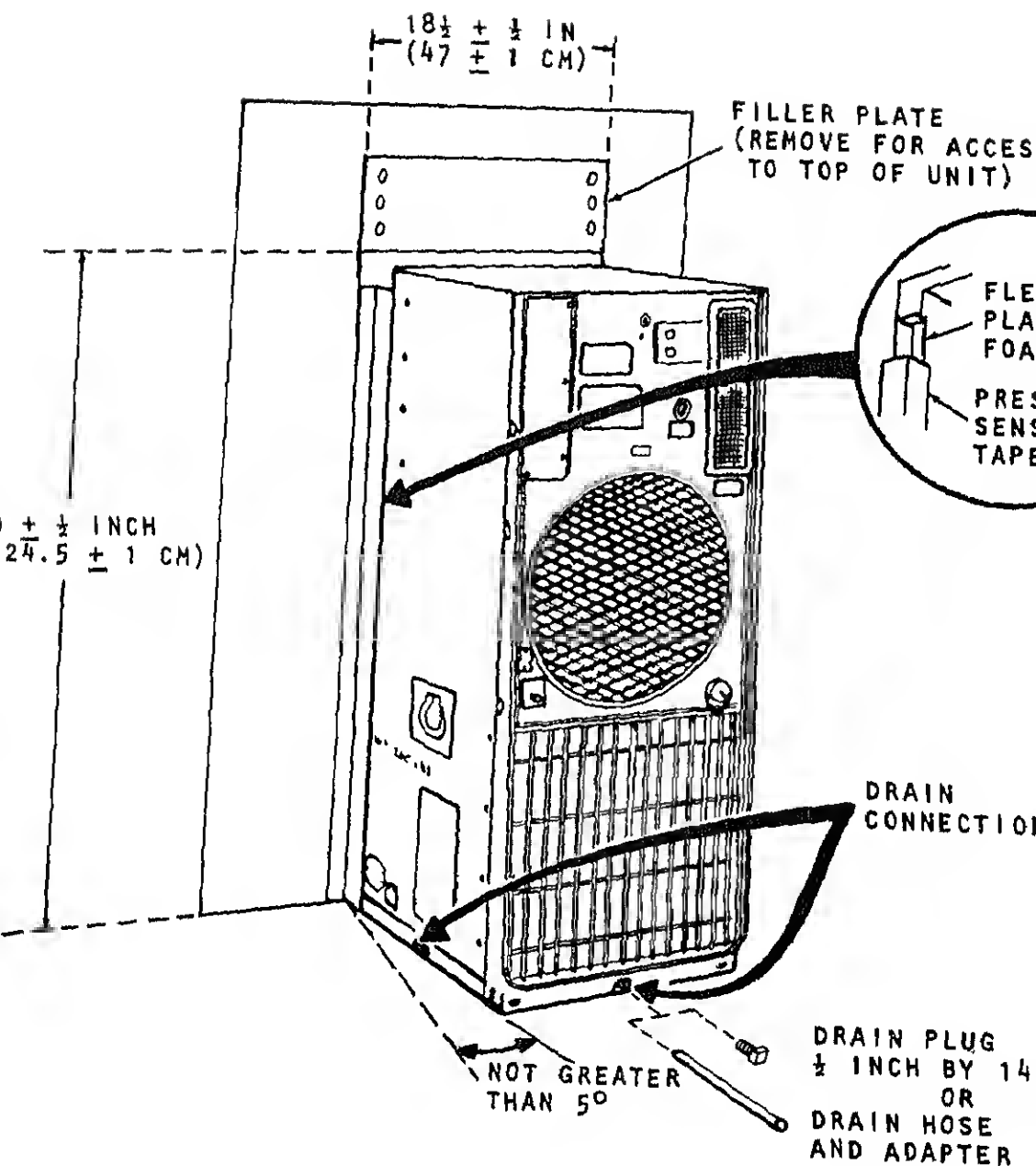


Figure 4-1. Installation

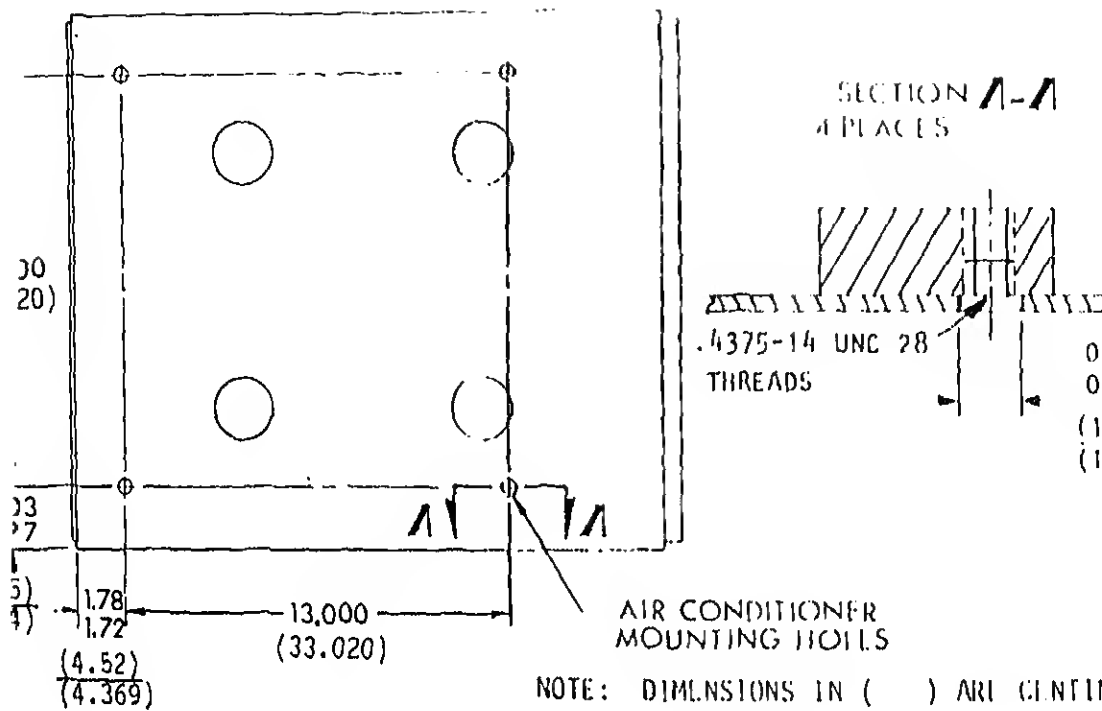


Figure 4-2. Base Plan

#### POWER SOURCE.

The air conditioner operates on 208 volts, 3-phase, 400 Her. The power input receptacle (figure 4-3) is located at the unit above the condenser coil inlet. Alternate locations for power connections are provided at both sides of the unit. This location may be used by interchanging the receptacle at the unit and one of the cover plates at each side of the unit. The unused receptacle locations are covered to prevent air being drawn through the opening. To move the power receptacle to alternate location proceed as follows:

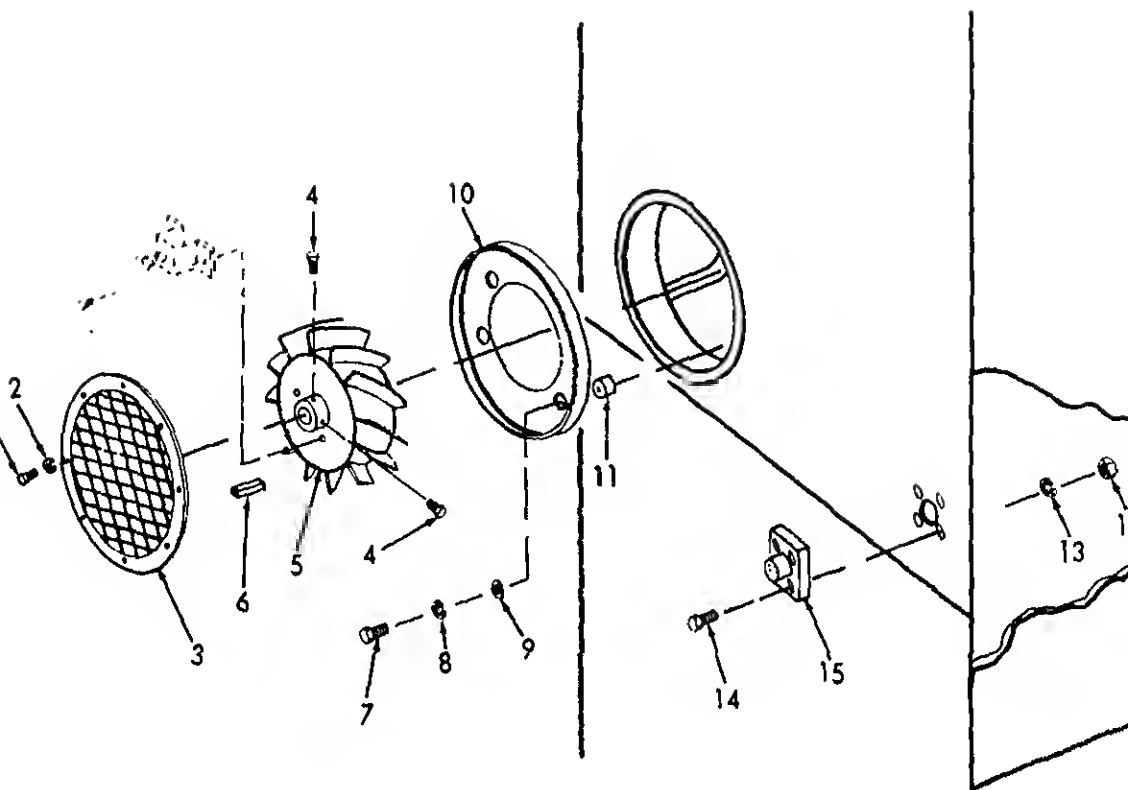


Figure 4-3. Power Receptacle Relocation (Sheet 1 of 2).

- (1) Remove screws (1) and lockwashers (2) securing condenser guard (3) to housing.
- (2) Remove condenser fan guard.
- (3) Remove set screws (4).
- (4) Using a wheel puller install two 1/4 inch bolts. Screw bolts evenly.
- (5) Remove condenser fan (5) and key (6).
- (6) Remove screws (7), lockwashers (8), washers (9), that baffle (10) and bushings (11).
- (7) Remove nuts (12), washers (13), and screws (14) that connector (15) to case.



- (1) Install plate (21) using screws (22), nuts (24) and washers (23), to the access hole where the connector (15) was removed.
- (2) Install connector (15) using screws (13), washers (14) and nuts (12).
- (3) Replace junction box (19).

**CAUTION**

DO NOT BEND TUBE

- (4) Tighten turn-button fasteners (18).
- (5) Reinstall lower panel (17), tighten turn-button fasteners (16).
- (6) Install baffle (10) and bushings (11) using screws (12), washers (9) and lockwashers (8).

**CAUTION**

Do not hammer the impeller onto the motor shaft. The motor bearings would be damaged. If difficulty is encountered, dress out rough spots on the shaft with a fine file, stone or abrasive cloth. Apply a coating of light oil to ease assembly.

Align keyways in shaft and impeller, install key (6). Press impeller (5) onto shaft. The end of the motor shaft should be even with the face of the hub when the impeller is completely in position. Tighten setscrews (4) firmly. Starting with the keyway setscrew, tighten to a final torque of 78-82 pound-inches (8.87-9.33 newton-meters).

**NOTE**

In order to direct the condenser exhaust upward and away from the intake, the condenser fan guard is designed so that it can be installed in only one way. All screw holes must match to permit proper installation.

- (8) Install condenser fan guard (3) with screws (1) and washers (2).



(3) Remove air intake grille (3) by loosening turn-button fasteners (4).

(4) Remove screw (5), filter retainer (6), and filter

(5) Remove screw (8) securing thermostat tube bulb (9) from control panel (10). Route bulb and tube through grommet (11).

(6) Loosen four turn-button fasteners (12) that attach junction box (13) to air conditioner.

**CAUTION**

When performing the following procedures. Do not bend bulb or tube (9).

(7) Carefully remove the junction box (13) from the air conditioner.

(8) Remove four turn-button fasteners (14) that attach control panel (15) and gasket (16) to junction box (13).

(9) Disconnect electrical connector (17) and remove control panel (15).

(10) Carefully coil thermostat tube and bulb on control panel as shown in figure 4-4 and install cable clamp (10) and screw (8).

(11) Attach electrical connector (17) to block off assembly (18).

(12) Install block-off assembly (18), using gasket (16) and screws (19) to junction box (13).

**NOTE**

Replace gasket if damaged or defective.

(13) Reinstall junction box (13), and tighten turn-button fasteners (12).



Remote control connection can be made as above or by removing the electrical connector from the blockoff assembly and installing it in one of the alternate electrical connection locations shown on figures 4-3

### Section III. PREVENTATIVE MAINTENANCE CHECKS AND SERVI

#### 5. GENERAL.

a. Preventative Maintenance Checks and Services (PMCS, T 1) are to be done at the Organizational Maintenance level to re the air conditioner is ready to use at all times. These d services help you find and fix defects before the air cond damaged or fails.

b. Item numbers in the first column of Table 4-1 are the der in which things are to be done. Column two "Interval" l en to do them and who should do them.

c. If minor defects are found when the air conditioner i ng take notes on what they are. Fix them or have them fixed u have stopped running the air conditioner.

#### NOTE

While the air conditioner is running, if any defect develops that you think will damage the air condi- tioner, stop it at once.

d. Record all defects and steps taken to fix them on DA 04 (Equipment Inspection and Maintenance Work Sheet) as soon ssible.

Before you operate: Always keep in mind the WARNINGS located on the inside front cover.

# Organizational Maintenance Preventive Maintenance Checks and Services

## NOTE

the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

If an item in a longer interval chart requires more frequent checking and servicing when the equipment is used in an unusual environment, the special intervals shall be indicated by an asterisk or similar indicator before the sequence number, and a letter after the sequence number. Footnotes explain special intervals.

W - Weekly

M - Monthly

Q - Quarterly

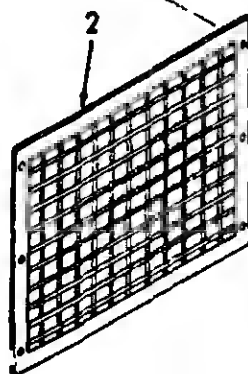
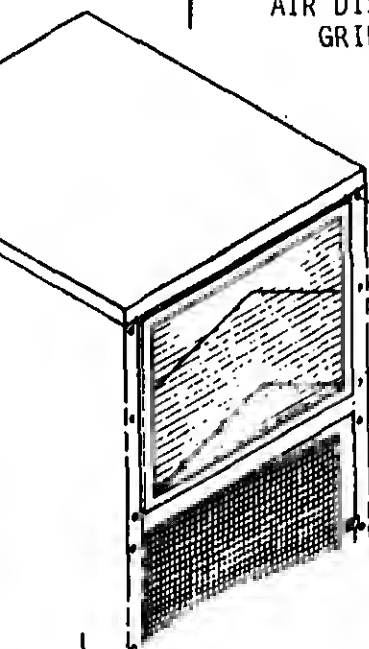
Interval		ITEM TO BE INSPECTED	PROCEDURE	Equipment is Not Ready/ Available If:
M	Q			

### WARNING

Dry cleaning solvent (Fed. Spec P-D-680) (item 3, table E-1) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).

AIR DISCHARGE GRILLE

Loosen turn-lock fasteners (1) and remove grille (2). Remove excess amounts of dirt and clean with dry compressed air.



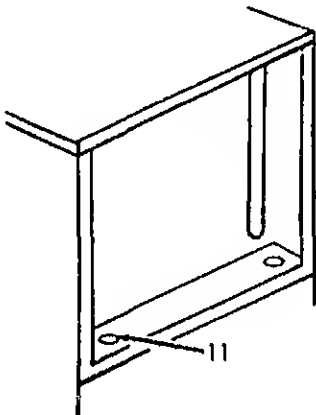
ber	W	M	Q	INS. COVERED	Available
2			•	MIST ELIMINATOR	<p>Loosen turnbuttons (3). Remove screws (4), washers (5), and remove canvas cover assembly (6). Remove screws (7), washers (8) and top cover (9). Lift mist eliminator (10) and remove. Clean mist eliminator with approved cleaning solvent (item 3, table E-1) and dry with compressed air. (See Item 13 and clean evaporator coil while mist eliminator is removed.)</p>

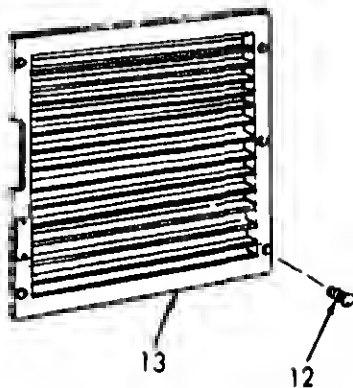
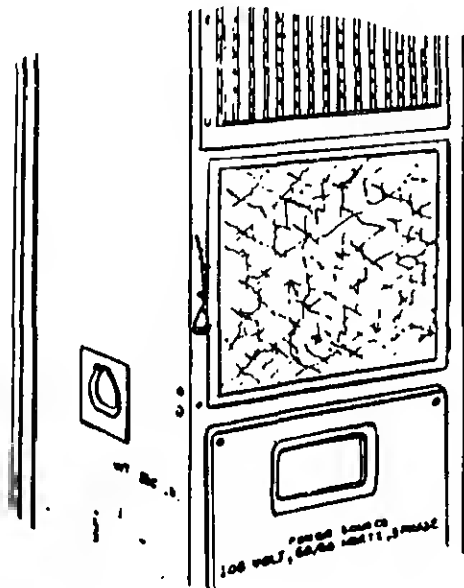
# -1. Organizational Maintenance Preventive Maintenance Checks and Serv (Cont'd)

W - Weekly

M - Monthly

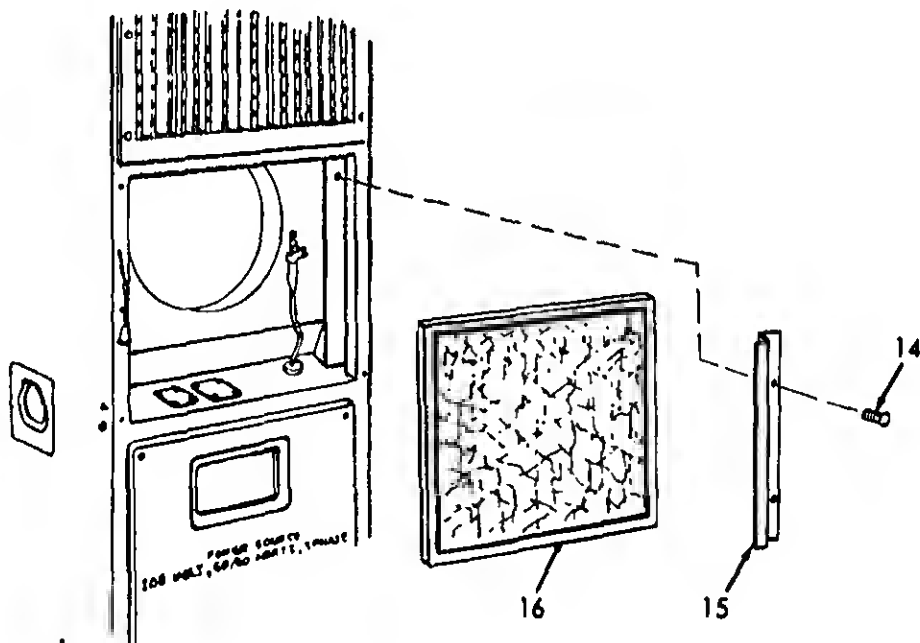
Q - Quarterly

Interval			ITEM TO BE INSPECTED	PROCEDURE	Equipment Not Ready/ Available
W	M	Q			
		•	<p>DRIP PAN ASSEMBLY</p>  <p>AIR INTAKE GRILLE</p>	<p>With the mist eliminator removed, clean the drip pan assembly (11). Inspect drain holes and remove accumulated dirt. Reinstall mist eliminator with drain holes at the bottom. Reinstall top cover, canvas cover and air discharge grille in reverse order of removal.</p> <p>Loosen turn-lock fasteners (12) and remove grille (13). Remove excess dirt and clean with dry compressed air.</p>	

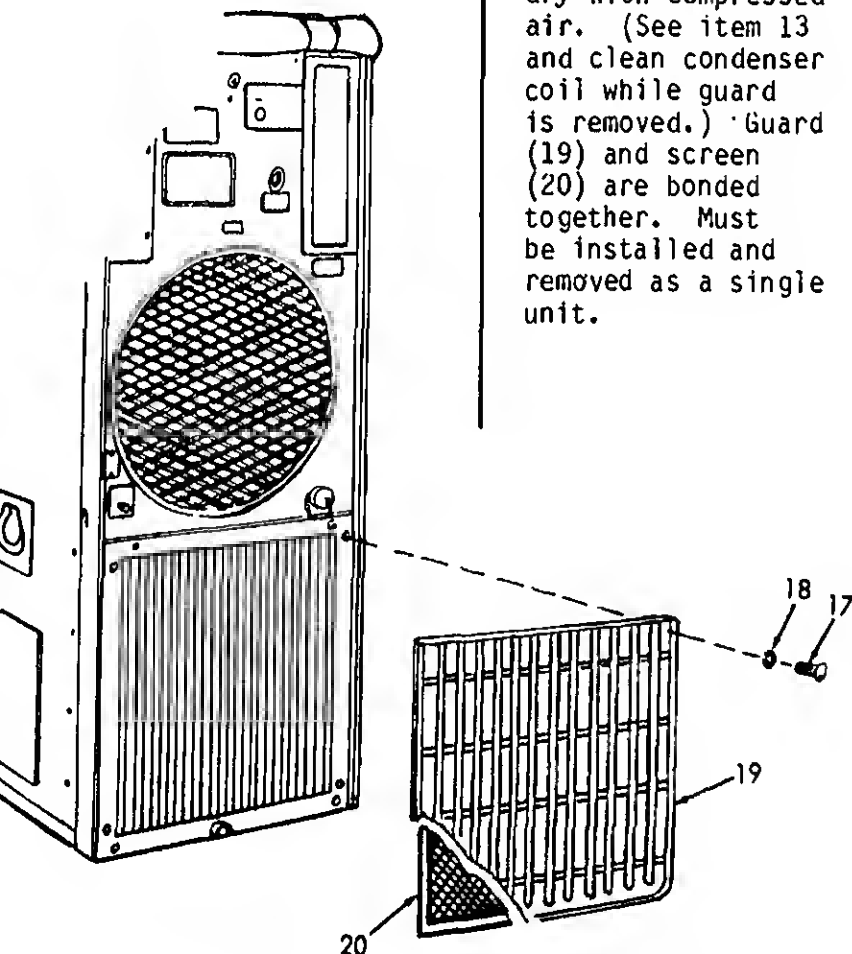


FRONT  
AIR FILTER

Remove screws (14), and filter retainer (15). Remove air filter (16). Clean with cleaning solvent (item 3, table E-1) and dry with compressed air. Dip or spray filter with filter - kote (item 5, table E-1) or oil, grade 20, 30, or better (item 9, table E-1). Reinstall air filter and air intake grille in reverse order of removal.



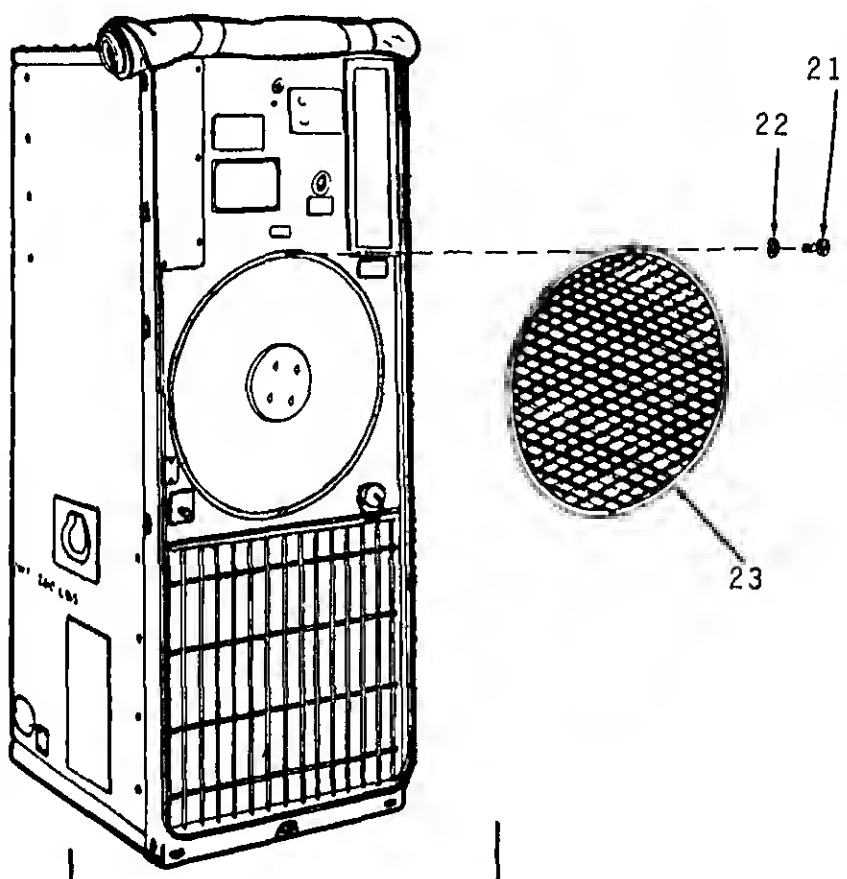
val	ITEM TO BE INSPECTED	PROCEDURE	Equipment Is Not Ready/ Available If:
Q	<p>REAR</p> <p>CONDENSER COIL GUARD</p>	<p>Remove screws (17), washers (18), and remove guard (19). Screen (20) is now accessible. Clean guard to remove excess dirt with a brush. Clean screen with cleaning solvent (item 3, table E-1) and dry with compressed air. (See item 13 and clean condenser coil while guard is removed.) Guard (19) and screen (20) are bonded together. Must be installed and removed as a single unit.</p>	





CONDENSER FAN  
GUARD

Remove screws (21) and lockwashers (22) securing guard (23) to case. Clean with cleaning solvent (item 3, table E-1) and dry with compressed air. Reinstall after cleaning.

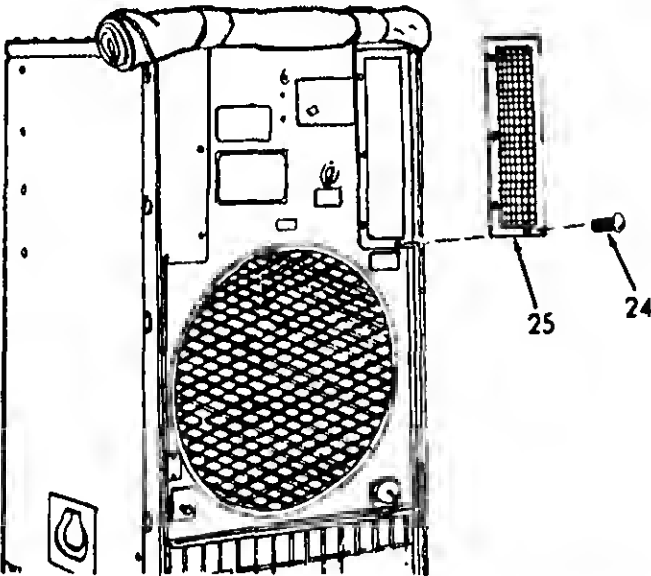


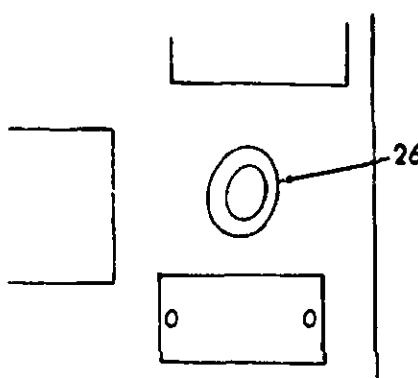
# Organizational Maintenance Preventive Maintenance Checks and Services (Cont'd)

daily M - Monthly

Q - Quarterly

Q	ITEM TO BE INSPECTED	PROCEDURE	Equipment Is Not Ready/ Available If:
	FRESH AIR SCREEN	<p>Remove screws (24) that attach screen (25) to case. Clean with cleaning solvent (item 3, table E-1) and dry with compressed air. Reinstall after cleaning.</p>	



umber	W	M	Q	INSPECTED		Not Ava
9	•			<p>SIGHT GLASS</p> 	<p>Inspect sight glass (26) for bubbles and color condition. If bubbles are observed after 20 minutes of cooling operation, the refrigerant charge is low. If a green-yellow or yellow color is seen after one hour of operation, the refrigerant system may contain moisture. Report either condition to Direct Support Maintenance.</p>	
10			•	CONTROLS	Check for proper operation.	
11			•	FAN	Check for unusual noise or vibration.	
12			•	WIRING	Check for worn or frayed insulation.	
13			•	EVAPORATOR AND CONDENSER	Clean coils with a brush and low pressure compressed air.	

## Section IV. TROUBLESHOOTING

GENERAL.

Table 4-2 lists the common malfunctions which you may find during operation or maintenance of the air conditioner or its components. You should perform the tests/inspections and corrective actions indicated.

This manual cannot list all malfunctions that may occur, nor the tests or inspections and corrective actions. If a malfunction is not corrected by listed corrective actions, notify your supervisor.

Table 4-2. Organizational Maintenance Troubleshooting

SYMPTOM

TEST OR INSPECTION

CORRECTIVE ACTION

### COMPRESSOR

Compressor will not start.

Step 1. Check circuit breaker for tripped condition.

Reset circuit breaker. If compressor fails to start, test circuit breaker (para 4-30).

Step 2. Check high and low pressure cut out switches for tripped condition. Reset pressure switches.

For replacement refer to direct support maintenance.

Step 3. Test fuses (para 4-29).

Step 4. Test circuit breaker for defective condition (para 4-30).

Step 5. Test for an open-circuit condition in the control circuit by means of a continuity check.

Replace component or wire causing open circuit (para 4-28).

Step 6. Check to see if compressor motor or thermal p  
are defective (para 4-40).

For replacement refer to direct support maintenance

2. Compressor starts but immediately stops.

Step 1. Repeat test or inspections in steps 1 and 2 a  
compressor starts and immediately stops again  
condition to Direct Support Maintenance.

#### HEATING

1. Little or no heating capacity.

Step 1. Check for loose electrical connections or fau  
Repair or replace wiring as necessary (para 4-45)

Step 2. Test rotary selector switch and temperature c  
thermostat for faulty wiring.

Replace defective switch (para 4-25 and 4-26).

Step 3. Test heater relay for faulty contact closure.

Replace defective relay (para 4-31).

Step 4. Test for defective operation of heater high t  
cutout.

Replace defective thermostatic switch (para 4-43).

Step 5. Test heater for open-circuited element.

Replace defective heaters (para 4-43.1).

## INSPECTION

## CORRECTIVE ACTION

---

### COOLING

ient cooling.

Observe sight-glass for low refrigerant charge  
(Table 4-1, Item 9).

If low refrigerant charge is observed, refer to direct  
support maintenance.

Check for indications of defective solenoid valve  
operation.

Replace defective solenoid valve coil (para 4-42.2). If  
solenoid valve is defective, refer to direct support  
maintenance.

### Section V.

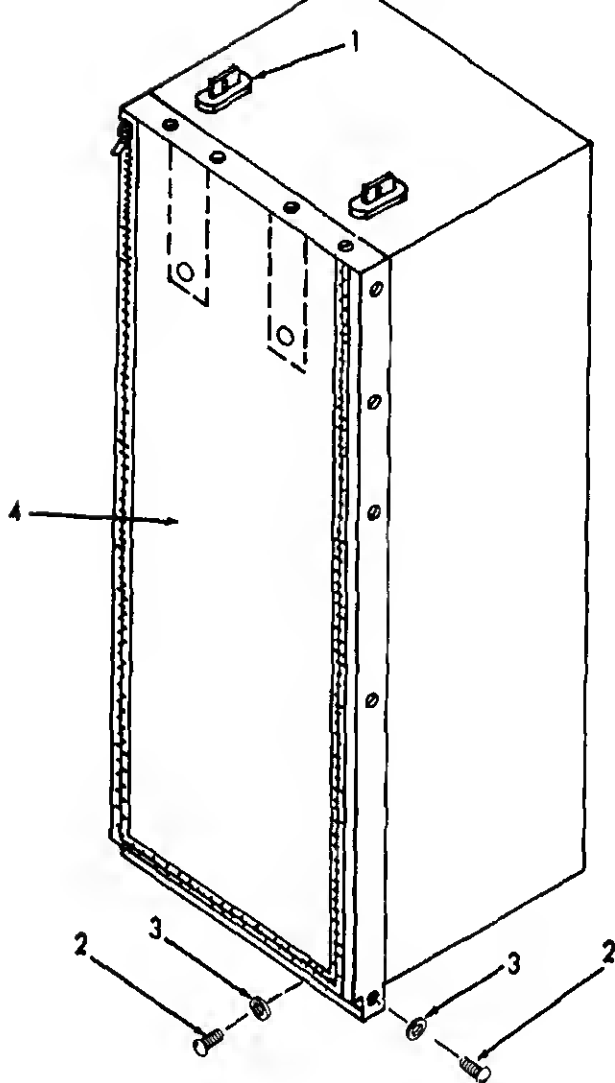
### MAINTENANCE PROCEDURES

Procedures in this section have been arranged in the order in  
which they appear in the organizational (O) maintenance level  
Maintenance Allocation Chart (MAC) which is provided in  
Step-by-step-procedures have been provided for all actions  
to be performed by organizational maintenance in the order  
they appear on the MAC. Actions authorized to be performed  
by general support maintenance have been duly noted;  
procedures for these actions may be found in Chapters 5  
and 6 respectively.

### COVER.

on.

The cover is made of vinyl impregnated nylon cloth. Small  
stitches are sewn into the hems on the edges of the cover that  
give the cabinet its shape. The back flap of the cover  
is in position when closed by means of zippers at the sides.  
Two straps with eyelets in the ends are sewn into the top



b. Removal.

- (1) Turn turn-lock fasteners (1) and roll canvas. Zip the canvas cover closed.
- (2) Remove 18 screws (2) and washers (3) that attach cover (4) to the outer case.
- (3) Remove cover (4).

c. Inspection.

Inspect canvas cover for damage. Replace if

Attach canvas cover (4) to top panel with 18 screws (2), washers (3).

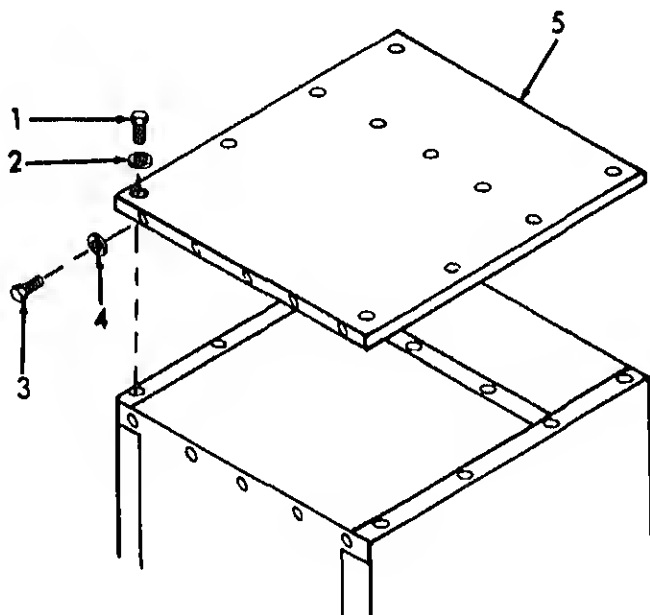
## ANEL ASSEMBLY.

ion.

panel is an assembly that encloses the top of the air cabinet. Gasket strips are glued to the bottom of the form a seal. Insulation material is glued to the bottom panel to minimize heat gain/loss and sound transmission.

## ary Procedure.

canvas cover (para 4-8).



Remove screws (1), and preformed packing (2).

Remove screws (3), and washers (4).

Remove top panel assembly (5).

## on and Replacement.

Inspect for loose or damaged gaskets.

Replace damaged gasket material and secure gaskets with adhesive (Item 2, table E-1).



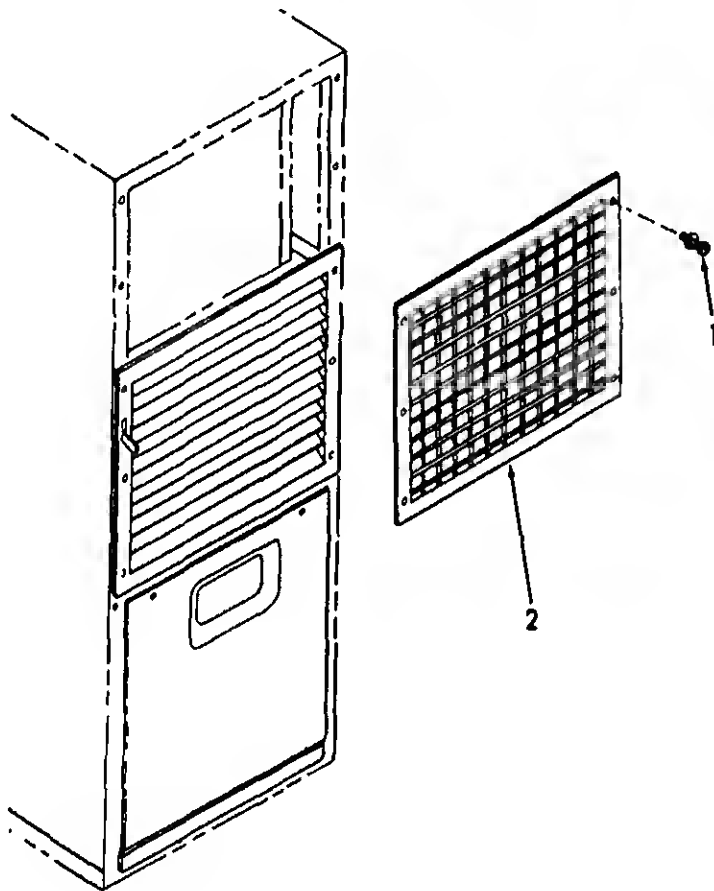
(2) Attach top panel assembly (5) using screws (1) and formed packing (2), screws (3) and washers (4).

(3) Install canvas cover, (para 4-8).

#### AIR DISCHARGE GRILLE.

Description.

The grille is equipped with two sets of independently mounted blades. The horizontal blades can be positioned to direct the air forward or downward. The vertical blades can be positioned to direct air to one or both sides of the center.



Removal.

(1) Twist turnbutton fasteners (1).

(2) Remove air discharge grille (2).

## WARNING

cleaning solvent, P-D-680 (item 3, table E-1), to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).

Brush off loose dirt or foreign matter.

Wipe louvers with a cloth dampened with dry cleaning solvent, (item 3, table E-1).

and Repair.

Inspect for bent or broken louver blades.

Straighten bent louver blades with standard pliers.

Inspect for loose or damaged gaskets.

Replace damaged gasket material and secure gaskets with adhesive (item 2, table E-1).

Maintenance procedure for replacing screw turnlock.

on.

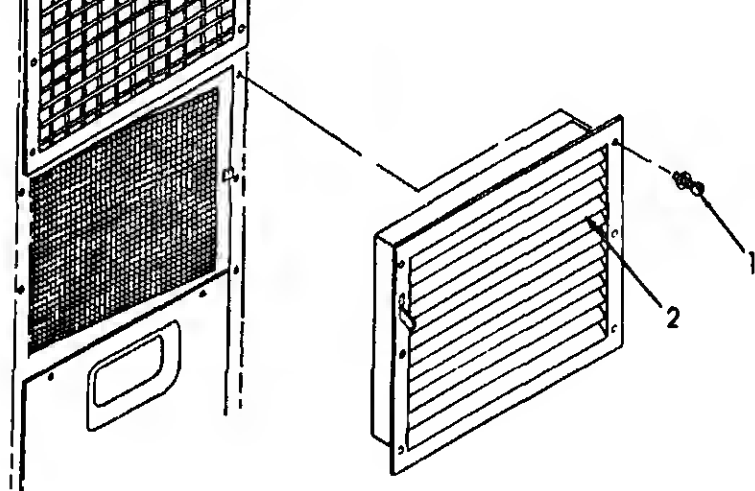
Align holes in air discharge grille with holes in housing.

Attach air discharge grille (2) with turnbutton fasteners (1).

AKE GRILLE.

n.

e is equipped with blades which are connected by a linkage so that all blades open or close together. This linkage is used to control the volume of air passing through the grille. When the damper is closed, the volume of air drawn in through the grille is reduced. When the damper is open, the volume of air drawn in through the grille is increased.



Removal.

- (1) Twist turnbutton fasteners (1).
- (2) Remove air intake grille (2) from housing.

Service.

### WARNING

Dry cleaning solvent P-D-680 (item 3, table E-1), used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).

- (1) Brush off loose dirt or foreign matter.
- (2) Wipe louvers with a cloth moistened with dry cleaning solvent, (item 3, table E-1).

Inspection and Repair.

- (1) Inspect for bent or broken louver blades.
- (2) Straighten bent louver blades with standard pliers.
- (3) Inspect for loose or damaged gaskets.

Replace damaged gasket material and secure gaskets with adhesive (item 2, table E-1).

Maintenance procedure for replacing screw turnlock.

tion.

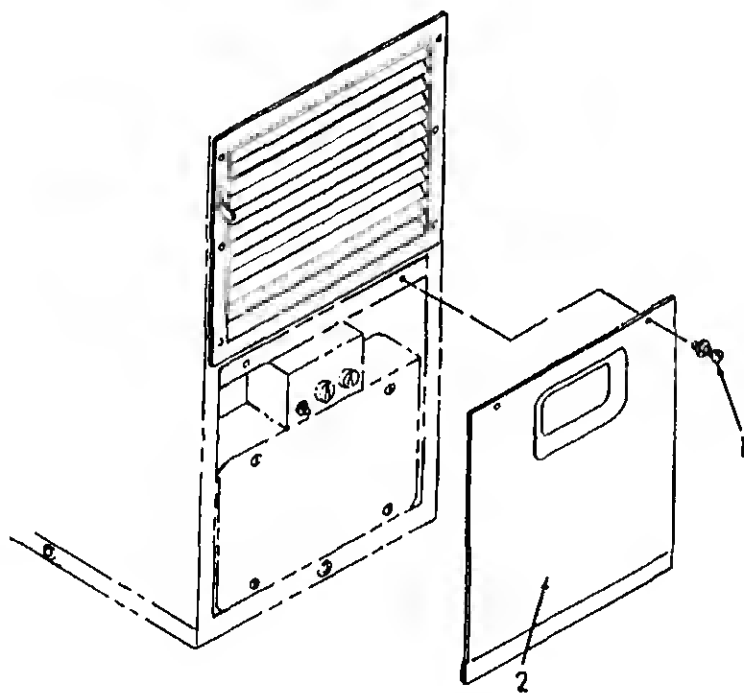
Align holes in air intake grille with holes in housing.

Secure air intake grille (2) with turnbutton fasteners (1).

PANEL.

tion.

er panel encloses and seals the lower front area of the er. It contains a depressed cutout opening to provide e control panel. The opening is sealed with an KFI- sket. The wiring diagram is located on the back side of



Loosen panel fasteners (1).

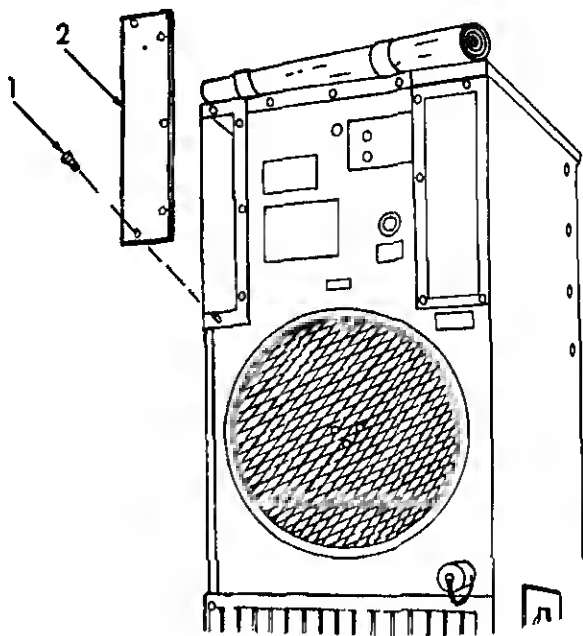
Remove lower panel (2).

on and Repair.

Inspect for loose or damaged gaskets.

Replace damaged gasket material and secure gaskets with adhesive (Item 2, table E-1).

The chemical-biological-radiological (CBR) air filter to the air conditioner is located in the upper left corner of the surface of the air conditioner. When CBR equipment is in use, the opening is closed by a sheet metal cover.



**b. Preliminary Requirements.**

Remove canvas cover (para 4-8).

**c. Removal.**

- (1) Remove screws (1) that attach CBR cover
- (2) Remove cover.

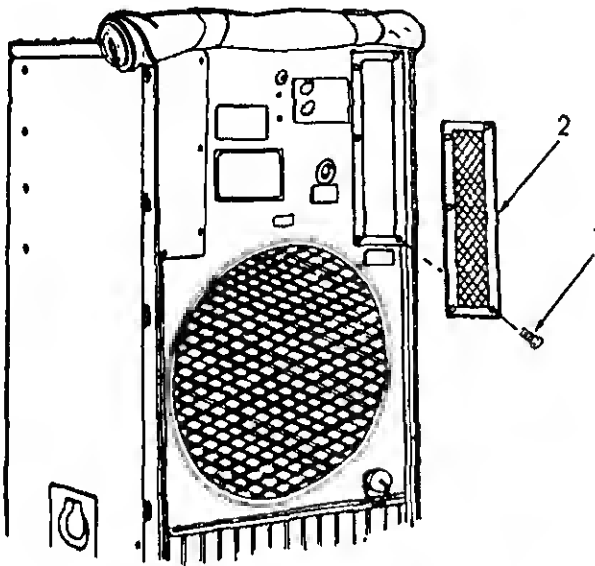
**d. Installation.**

- (1) Align holes in CBR cover with holes in
- (2) Install cover (2) using screws (1).
- (3) Install canvas cover (para 4-8),

## AIR SCREEN.

tion.

sh air screen is mounted on the upper right corner of the of the air conditioner. It encloses the two refrigera- valves, and prevents leaves and other debris from entering r intake opening.



### ary Requirements.

canvas cover, (para 4-8).

Remove screws (1) securing fresh air screen (2) to housin

Remove fresh air screen.

### on and Service.

#### **WARNING**

y cleaning solvent, P-D-680 (item 3, table E-1), ed to clean parts is potentially dangerous to rsonnel and property. Avoid repeated and pro- nged skin contact. Do not use near open flame or ccessive heat. Flash point of solvent is 100°F (38°C).

Brush off loose dirt or foreign matter.

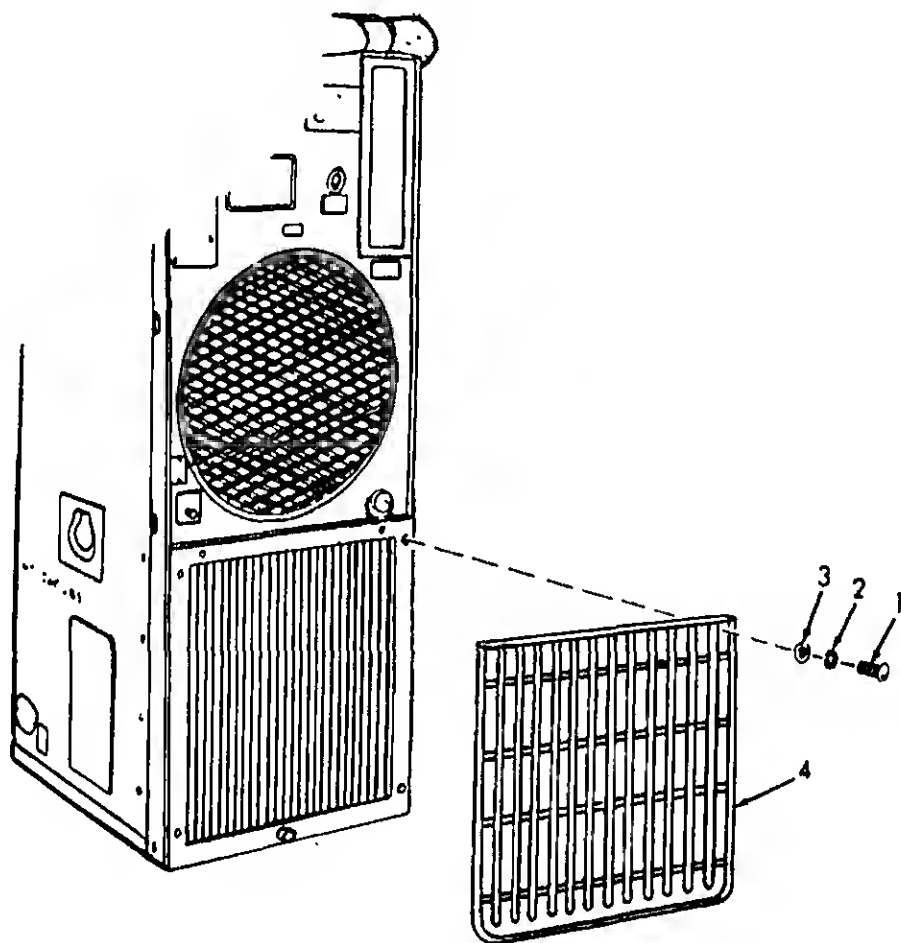
(2) Secure fresh air screen (2) with screws (1).

(3) Install canvas cover (para 4-8).

### CONDENSER COIL GUARD.

scription.

The condenser coil guard occupies the bottom one-third of the surface of the air conditioner. It is aluminum fabrication, consisting of a grid of 3/16-inch aluminum rods in a frame of aluminum. The face of the guard is covered with 16-mesh aluminum wire to prevent the entry of leaves and other small debris. The guard is secured to the casing of the air conditioner with screws and washers.



## Primary Requirements

canvas cover (para 4-8).

Remove screws (1), lock-washers (2) and flat washers (3) securing condenser coil guard (4) to housing.

Remove condenser coil guard.

and Inspection.

### WARNING

Dry cleaning solvent, P-D-680, (item 3, table E-1), used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).

Brush off loose dirt or foreign matter.

Wipe condenser coil guard with a cloth moistened with drycleaning solvent, (item 8, table E-1).

Inspect condenser coil guard for damage.

ation.

Align holes in condenser guard with holes in housing.

Secure condenser coil guard (4) with screws (1), lockwashers (2), and flat washers (3).

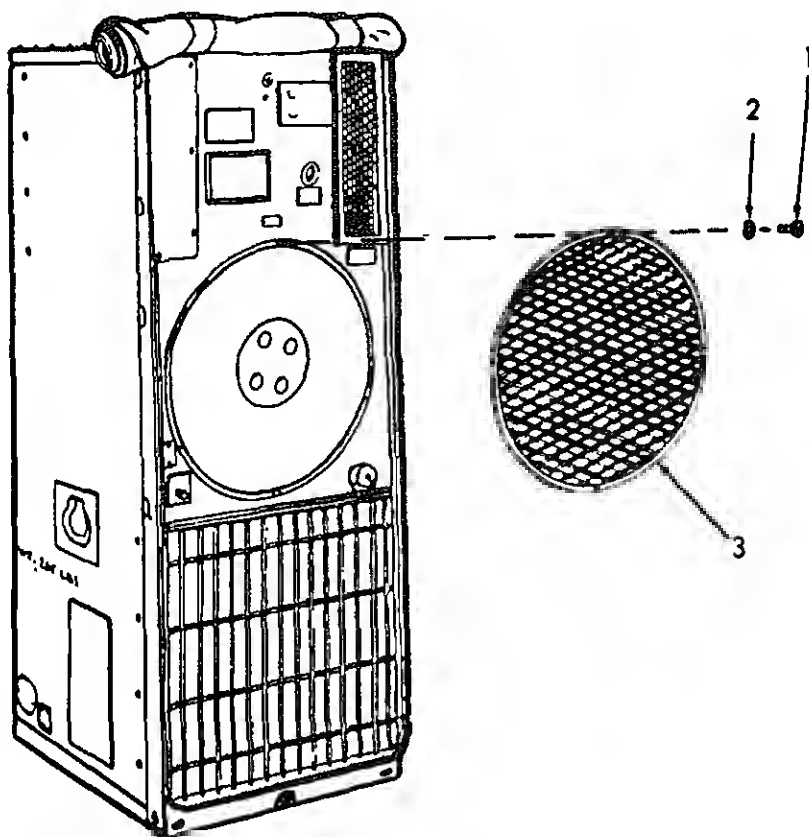
Install canvas cover (para 4-8).

## CONDENSER FAN GUARD.

ion

Condenser fan guard is mounted near the middle of the rear of the air conditioner. The guard is fabricated from heavy-gauge metal mesh mounted in a circular sheet-metal frame. The screw holes in the frame are purposely arranged in an offset pattern, so that the fan guard can be installed in only one direction. For installation it is necessary to orient the angle of the guard so that hot exhaust air will be deflected upward, away from the condenser coil intake.





## Removal

- (1) Remove screws (1) and lockwashers (2) securing condenser fan guard (3) to housing.
- (2) Remove condenser fan guard.

## Service and Inspection.

### WARNING

Dry cleaning solvent, P-D-680, (item 3, table E-1), used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).

- (1) Brush off loose dirt or foreign matter.
- (2) Wipe condenser fan guard with a cloth moistened with dry cleaning solvent, (item 3, table E-1).
- (3) Inspect condenser fan guard for damage.

(2) Secure condenser fan guard (3) with screws (1) and lockwashers (2).

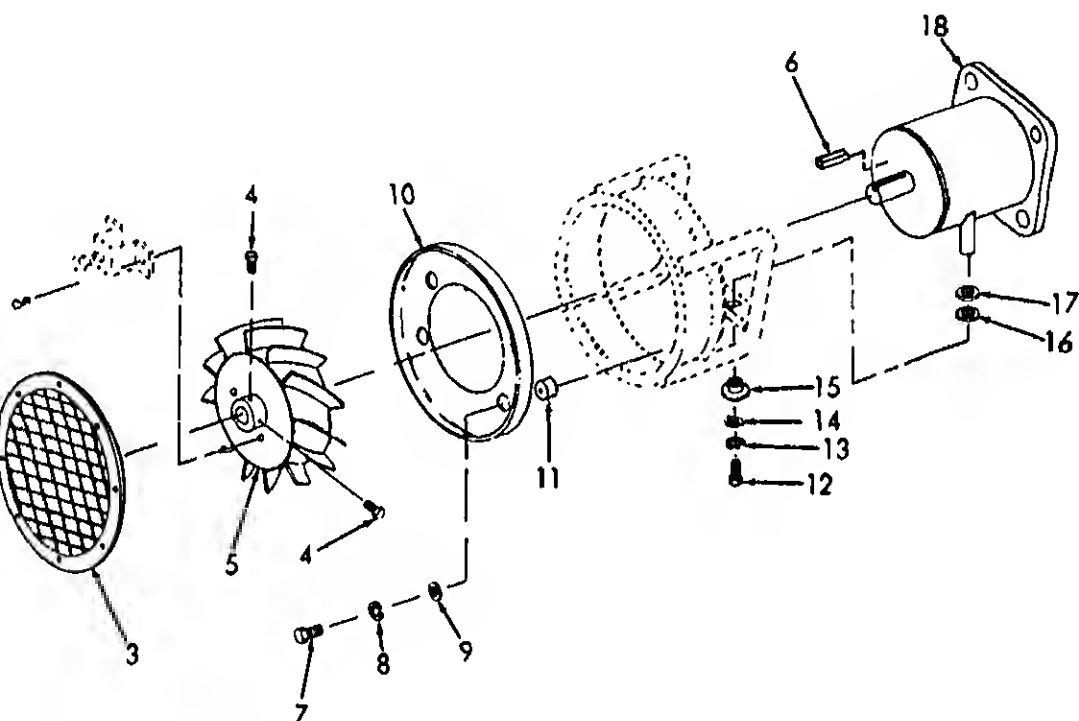
MOTOR SUPPORT.

ption.

Two-speed fan motor support is a welded fabrication of tub-formed sheet metal which supports the rear end of the motor. Attached to the rear panel with rivet nuts which are used to attach the condenser fan guard to the unit.

al Tools

puller.



Primary Requirements,

Canvas Cover (para 4-8) or roll up and secure with turn

al.

(1) Remove screws (1), and washers (2) that attach condenser fan guard (3) to housing.

(2) Remove condenser fan guard (3).

(3) Remove set screws (4).

- (4) Using a wheel pulier, install two 1/4 inch bolts in bolts evenly.
- (5) Remove condenser fan (5) and key (6).
- (6) Remove screws (7), lockwashers (8), washers (9) attach baffle (10) and bushings (11).
- (7) Remove baffle (10) and bushings (11).
- (8) Remove screws (12), lockwashers (13), and washe
- (9) Remove grommet (15), motor mount bushing (16) a (17) from under motor (18).

#### . Inspection.

- (1) Inspect motor mount bushing. Replace if defect
- (2) Four bushing sizes are available as follows:
  - (a) 13215E9824 -1, 0.094 inch
  - (b) 13215E9824 -2, 0.125 inch
  - (c) 13215E9824 -3, 0.156 inch
  - (d) 13215E9824 -4, 0.188 inch

#### . Installation.

- (1) Install proper bushing (16) into base of motor
- (2) Insert shim (17), grommet (15).
- (3) Install screw (12), lockwasher (13), washer (14
- (4) Install baffle (10) and bushing (11), using scr lockwasher (8), and washer (9).

#### CAUTION

Do not hammer the impeller onto the motor shaft. The motor bearings would be damaged. If difficulty is encountered, dress out rough spots on the shaft with a fine file, stone or abrasive cloth. Apply coating of light oil to ease assembly.

- (5) Align key ways in shaft and impeller, install k press impeller (5) onto shaft. The end of the shaft should be even with the face of the hub w impeller is completely in position. Tighten se (4) finger tight. Starting with the keyway set tighten to a final torque of 78-82 pound-inches (9.33 newton meters).

# NOTE

In order to direct the condenser exhaust upward, away from the intake, the condenser fan guard is designed so that it can be installed in only one way. All screw holes must match to permit proper installation.

Install condenser fan guard (3) using screws (1) and lockwasher (2).

7) Install canvas cover (para 4-8), if required.

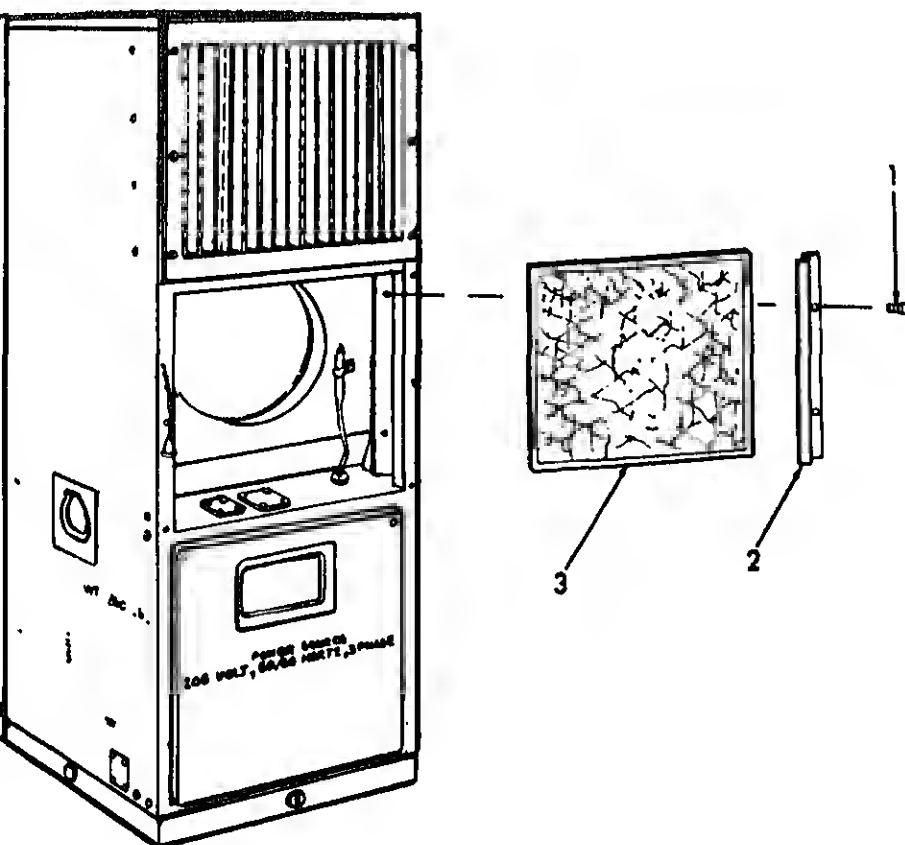
FILTER.

ion.

The filter consists of a shredded aluminum foil maze held in an aluminum channel frame. The filter can be re-used repeatedly. Airflow markings (arrows) printed on the filter make it easy to replace the filter in the correct position.

Assembly Procedure:

Remove air intake grille (para 4-11).



## Removal.

- (1) Loosen turnlock fasteners (1) securing air filter retaining bracket (2) to casing.
- (2) Remove air filter (3).

## Service and Inspection.

### WARNING

Do not use compressed air for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.

### WARNING

Dry cleaning solvent P-D-680, (item 3, table E-1), used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame, or excessive heat. Flash point of solvent is 100°F (38°C).

- (1) Clean air filter with dry cleaning solvent (item 3, table E-1) or warm soapy water.
- (2) Dry air filter with low pressure compressed air.
- (3) Inspect air filter for damaged or clogged condition.
- (4) Replace air filter if damage is indicated.
- (5) Spray air filter with Filter-Kote (item 5, table E-1).

## Installation

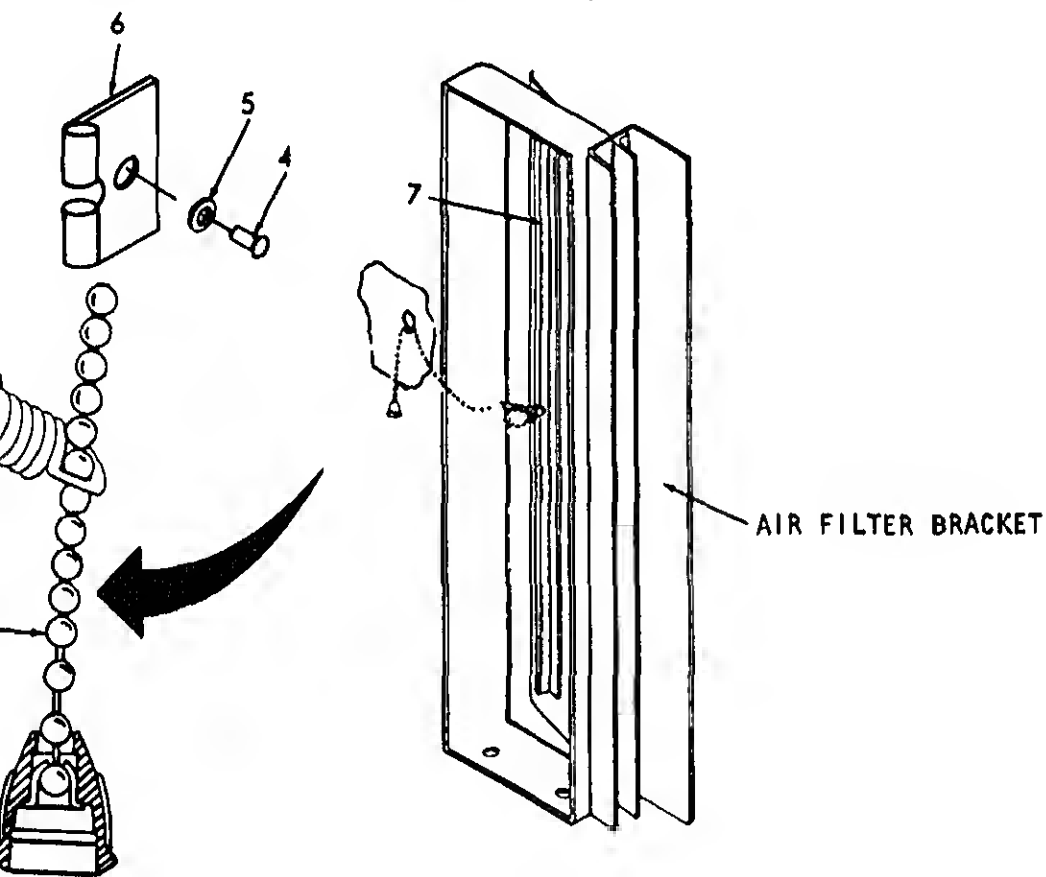
- (1) Install air filter (3) in housing with the air flow indicator in proper position.
- (2) Align holes in air filter retaining bracket (2) with holes in housing.
- (3) Secure air filter retaining bracket (2) with turnlock fasteners (1).
- (4) Install air intake grille (para 4-11).

dash air damper is a door spring-loaded to open, which is  
y desired degree by a ball-chain assembly. The ball chain  
ts desired position by a detent washer which accepts the  
n balls. A coil spring keeps some slack in the chain at  
s except fully closed and acts as a snubber to minimize  
 sudden closing of the damper door.

#### ary Procedures:

Remove air intake grille (para 4-11).

Remove air filter (para 4-18).



Unsnap pendant (1) from chain (2).

Remove pendant (1).

Unhook spring (3) from chain (2) and housing.

Remove chain (2).

(5) Drill out rivet (4) securing chain retainer (6) and flat washer (5) to housing.

(6) Remove chain (2) and flat washer (5), and chain retainer (6).

d. Inspection and Repair.

(1) Inspect pendant, spring and fresh air damper for damage.

(2) Replace pendant, spring, and chain if damage is indicated.

e. Installation.

(1) Align holes in chain retainer (6) and flat washer (5) with hole in housing.

(2) Secure chain retainer (6) and flat washer (5) with rivet (4).

NOTE

Rivet must be flat so that door will open and close properly.

(3) Insert one end of spring (3) into hole in housing.

(4) Hook the other end of spring around chain.

(5) Align slot in pendant (1) between the last two links of chain (2).

(6) Snap pendant (1) onto chain (2).

(7) Install air filter (para 4-18).

(8) Install air intake grille (para 4-11).

4-20. MIST ELIMINATOR.

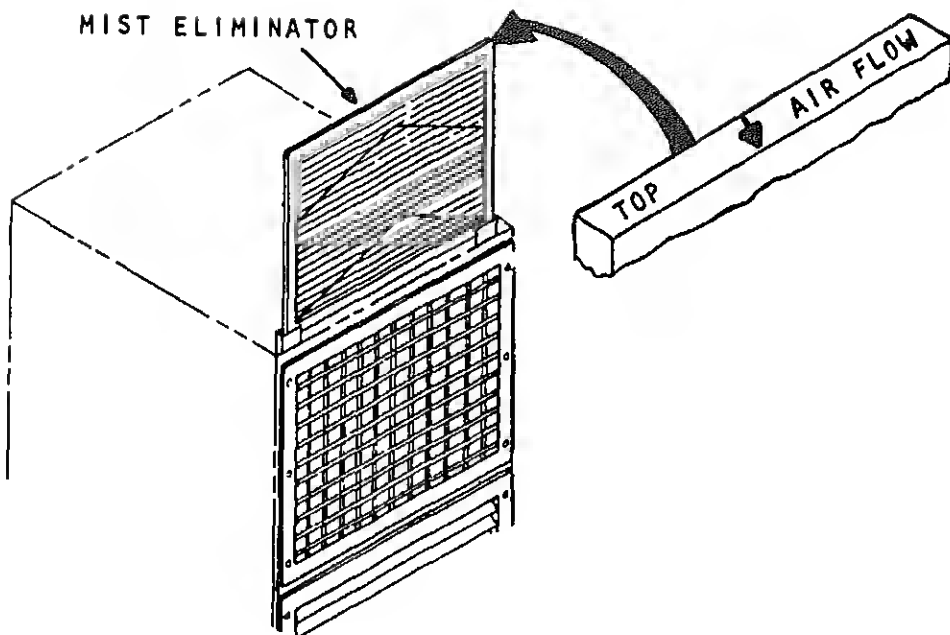
a. Description.

The mist eliminator is composed of eight double layers of aluminum mesh held between 1/4-inch mesh panels in an aluminum frame. The purpose of the mist eliminator is to trap droplets of condensation formed on the evaporator coil, so that they will not be blown into the air conditioned space.

b. Preliminary Procedure:

(1) Remove canvas cover (para 4-8).

(2) Remove top panel (para 4-9).



Pull mist eliminator up and out of housing.  
and Inspection.

**WARNING**

cleaning solvent, P-U-680 (item 3, table E-1), used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).

**WARNING**

Do not use compressed air for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.

Clean mist eliminator with warm soapy water or dry cleaning solvent (item 3, table E-1).

Dry thoroughly with low pressure compressed air.

Inspect for damaged or clogged condition.

Replace mist eliminator if damaged or clogged.



#### NOTE

The top of the mist eliminator is marked TOP with AIR FLOW arrows indicating the direction of air flow from the evaporator coil.

- (1) Locate the TOP and AIR FLOW arrows on the mist eliminator.
- (2) With the TOP of the mist eliminator at the top housing and AIR FLOW arrows pointing toward the top housing, install it in the mist eliminator bracket.
- (3) Install top panel, (para 4-9).
- (4) Install canvas cover (para 4-8).

#### 4-21. BLOCK-OFF PANEL.

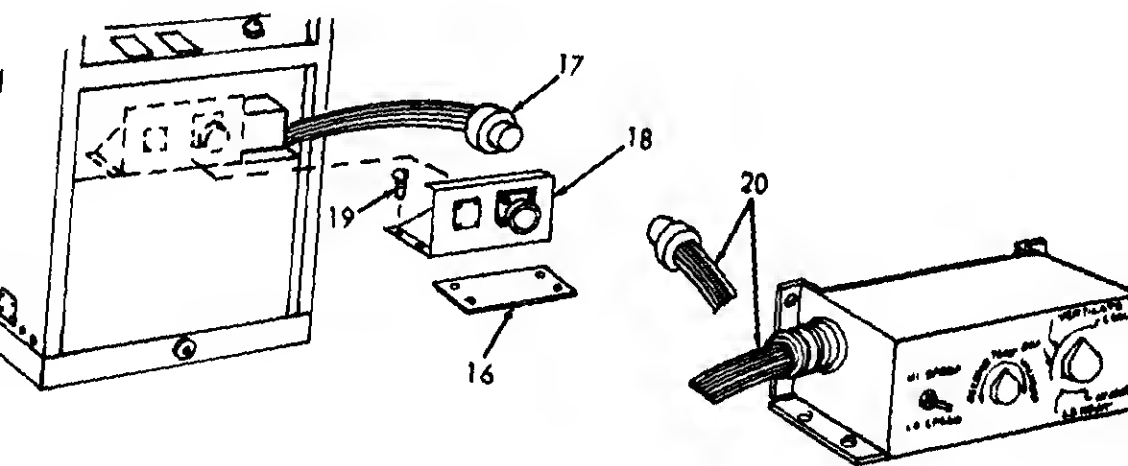
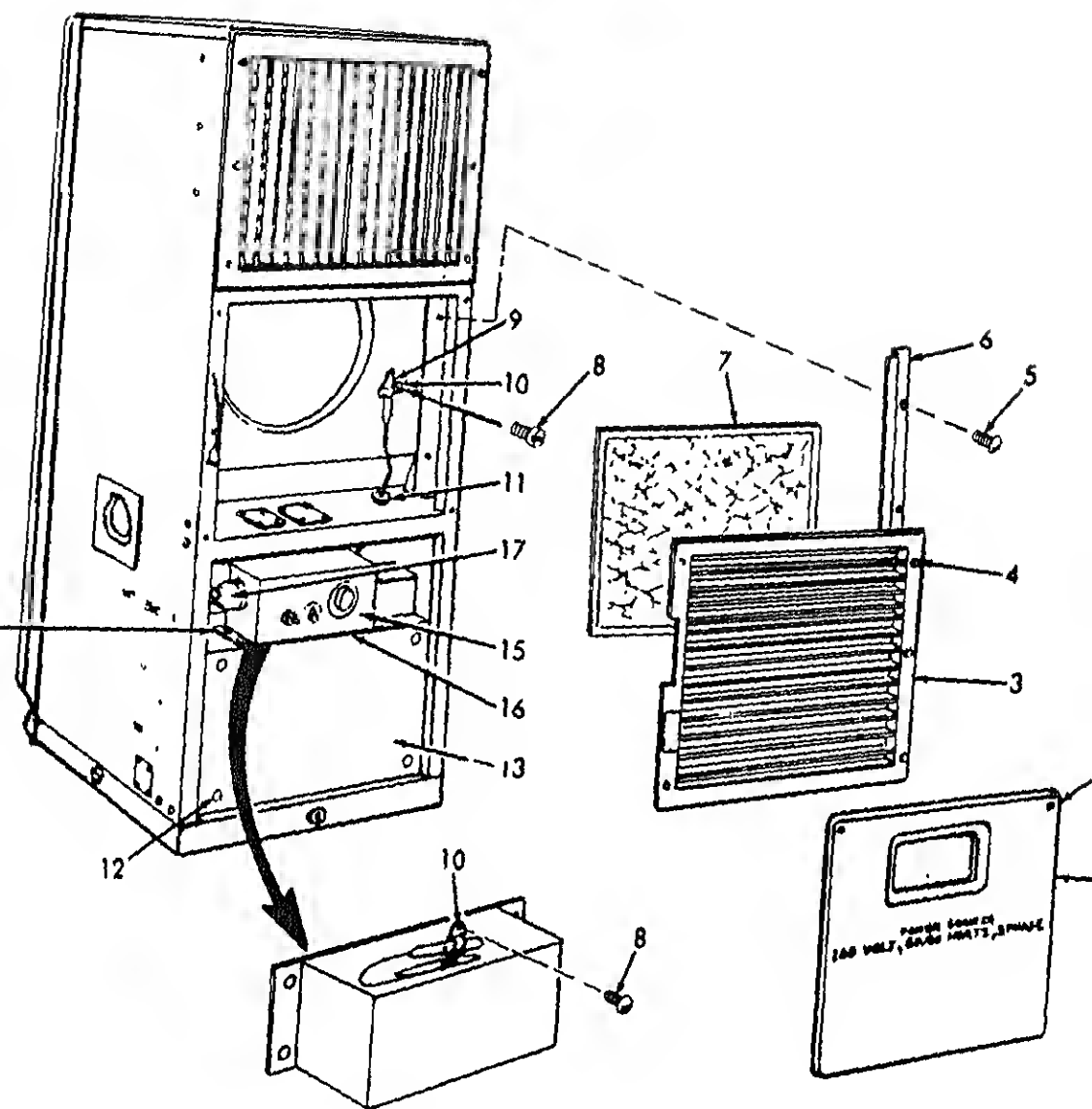
The block-off panel may be installed when the control is removed from the air conditioner to operate the unit by manual control. To install the block-off panel and relocate the control panel proceed as follows:

- (1) Disconnect electrical power from air conditioner.
- (2) Remove lower panel (1), by loosening two turn-button fasteners (2).
- (3) Remove air intake grille (3) by loosening turn-button fasteners (4).
- (4) Remove screw (5), filter retainer (6), and filter (7).
- (5) Remove screw (8) securing thermostat tube bulb (9) to clamp (10). Route bulb and tube through grommet (11).
- (6) Loosen four turn-button fasteners (12) that attach junction box (13) to air conditioner.

#### CAUTION

When performing the following procedures. Do not bend bulb or tube (9).

- (7) Carefully remove the junction box (13) from the air conditioner.
- (8) Remove four turn-button fasteners (14) that attach panel (15) and gasket (16) to junction box (13).



(9) Disconnect electrical connector (17) and remove panel (15).

(10) Carefully coil thermostat tube and bulb on control panel and install cable clamp (10) and screw (8).

(11) Attach electrical connector (17) to block-off assembly (18).

(12) Install block-off assembly (18), using gasket (18) and screws (19) to junction box (13).

#### NOTE

Replace gasket if damaged or defective.

(13) Reinstall junction box (13), and tighten turn-bushings (12).

(14) Reinstall air intake filter and air intake grille performing step 4 and step 3, above, in reverse order of removal.

(15) Connect remote control cable (20) to block-off assembly and control panel.

(16) Locate control panel as required.

#### NOTE

Remote control connection can be made as above or by removing the electrical connector from the block-off assembly and installing it in one of the alternate electrical connection locations shown on figure 4-3.

### 4-22. INSTRUCTION PLATES

#### a. Preliminary Procedures:

(1) Remove lower panel (para 4-12).

(2) Remove control panel (para 4-24).

(3) Remove rotary selector switch (para 4-25).

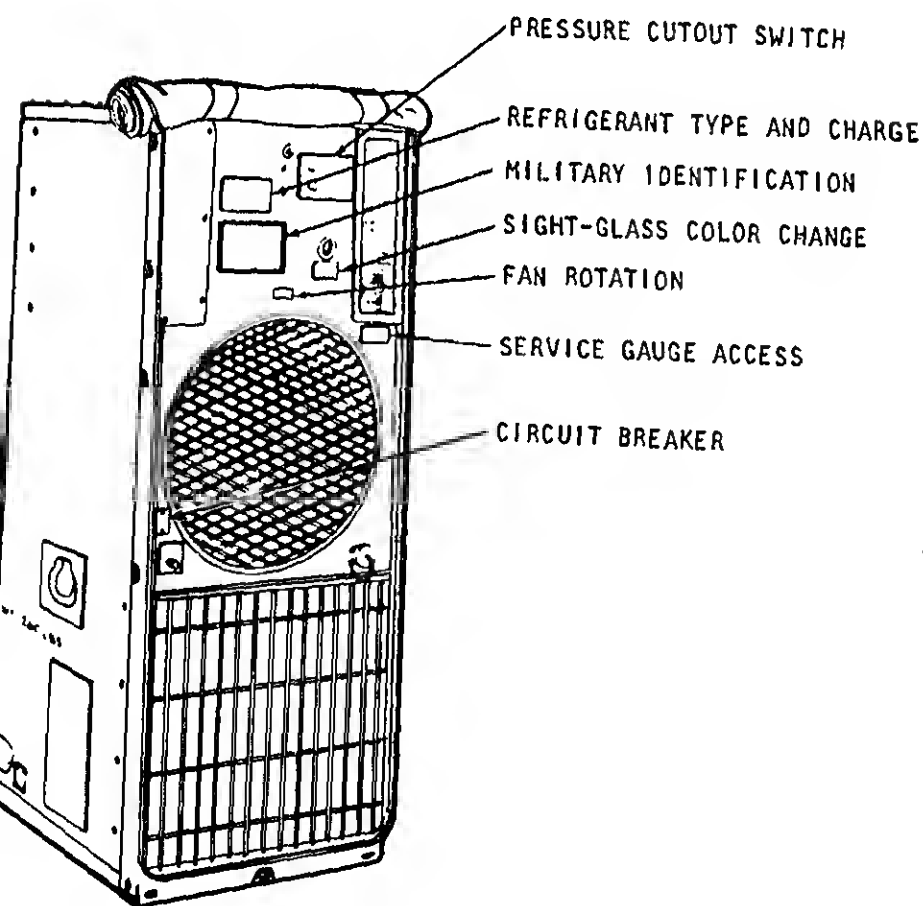
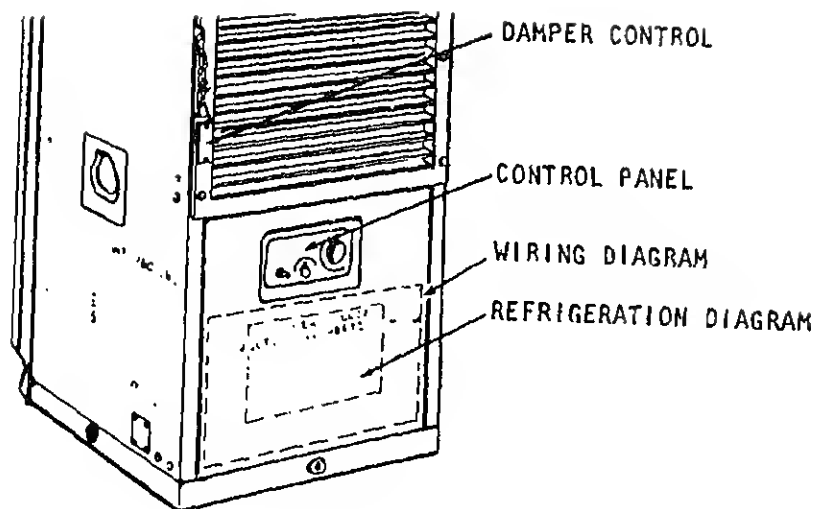
(4) Remove temperature control thermostat (para 4-26).

(5) Remove Fan Speed switch (para 4-27).

#### b. Removal.

Front of Housing

Wiring Diagram Plate



- 1 - Remove wiring diagram plate.
- 2 - Remove adhesive.

#### Control Panel Designation Plate

- 1 - Drill out rivets that secure the control panel plate to the control panel.
- 2 - Remove control panel designation plate.

#### Rear of Housing

##### Circuit Breaker Reset Information Plate

- 1 - Drill out blind rivets that secure the circuit breaker reset information plate to the rear of housing.
- 2 - Remove circuit breaker reset information plate.

##### Fan Rotation Indicating Plate

- 1 - Drill out blind rivets that secure the fan rotation indicating plate to the rear of housing.
- 2 - Remove fan rotation indicating plate.

##### Pressure Cut-Out Switch Information Plate

- 1 - Drill out blind rivets that secure the pressure cut-out switch information plate.
- 2 - Remove pressure cut-out switch information plate.

##### Moisture Indicator Information Plate

- 1 - Drill out blind rivets that secure the moisture indicator information plate to the rear of housing.
- 2 - Remove moisture indicator information plate.

##### Refrigeration Information Plate

- 1 - Drill out blind rivets that secure the refrigeration information plate to rear of housing.
- 2 - Remove refrigeration information plate.

##### Service Gauge Valves Instruction Plate

- 1 - Drill out blind rivets that secure the service gauge valves instruction plate.
- 2 - Remove service gauge valves instruction plate.

ation.

1 Instructions Plates with blind rivets, or adhesive as

ENSATE DRAINAGE SYSTEM.

tion.

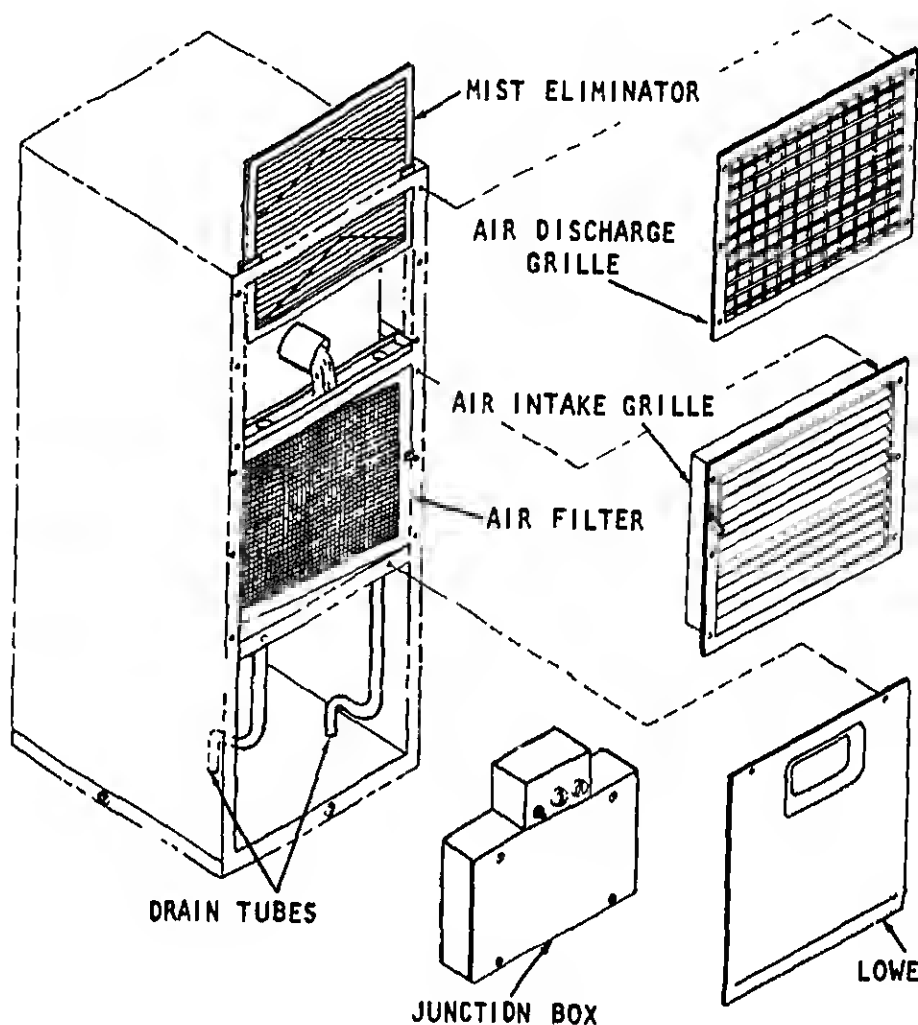
ndensate drainage system consists of a drip pan, mounted evaporator coil, and two tubes leading from the ends of n to the base plate. The tubes are equipped with spring-check valves at their bottom ends, to prevent the bypassthrough the tubes and around the evaporator intake. The of the air conditioner is fitted with pipe-threaded holes attachment of standard plumbing fittings or hose to conduct ate to a remote location.

the condensate drainage system occupies both sides of the e air conditioner from top to bottom, the top panel, lower oth evaporator grilles must be removed to gain access to tso, the air filter and the mist eliminator must be removed.

P PAN ASSEMBLY.

nary Procedures.

- Remove canvas cover (para 4-8).
- Remove top panel (para 4-9).
- Remove air discharge grille (para 4-10).
- Remove mist eliminator (para 4-20).
- Remove air filter (para 4-18).
- Remove lower panel (para 4-12).
- Remove junction box (para 4-28).



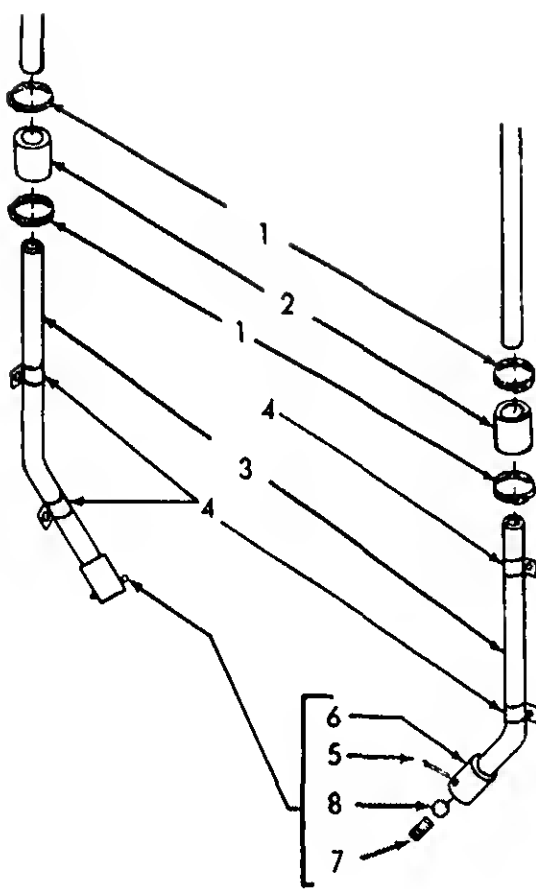
#### b. Inspection/Test.

Place a 2 by 4 inch board under one side of the air conditioner to tilt it slightly, then pour about one pint (one-half gallon) of water into the lower end of the drip pan below the evaporator. Verify that the water flows out of the drip pan through the drain tube. Tilt the air conditioner the opposite direction, and repeat the flow test on the other side. Water should drain freely through the drain tubes. If it does not, remove and repair or replace the drain tubes (refer to para 4-23.2).

### 4-23.2 LOWER DRAIN TUBE ASSEMBLY.

#### a. Preliminary Procedures.

- (1) Remove lower panel (para 4-12).



# ain Tubes.

- 1) Loose hose clamps (1) securing hoses (2) to drain tubes (3).
- 2) Remove hoses (2) and clamps (1).
- 3) Pull drain tubes (3) out of spring clips (4).

## 11 Check Assemblies

- 1) Remove cotter pin (5) from ball check seat (6).
- 2) Remove spring (7) and ball (8) from ball check seat (6).



c. Service and Inspection.

**WARNING**

Dry cleaning solvent, P-D-680, (item 3, table E-1) used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).

- (1) Flush out hoses and tubing with warm soapy water.
- (2) Use a small diameter brush or piece of soft cloth to clean out any accumulation of dirt or foreign matter from hoses and tubing.
- (3) Inspect hoses and tubing for split or deterioration in condition.
- (4) Clean ball and spring in dry cleaning solvent (table E-1) and dry thoroughly.
- (5) Inspect ball and spring for damage.
- (6) Replace any defective parts.

d. Installation.

Ball Check Assemblies

- (1) Install ball (8) and spring (7) into ball check (6).
- (2) Secure ball and spring with cotter pin (5).

Drain Tubes

- (1) Press drain tube (3) into spring clips (4) in housing.
- (2) Install hose clamps (1) and hoses (2).

e. Final Installation (install the following as needed.)

- (1) Install junction box (para 4-28).
- (2) Install lower panel (para 4-12).
- (3) Install air filter (para 4-18).
- (4) Install mist eliminator (para 4-20).

- (5) Install air discharge grille (para 4-10).
- (6) Install top panel (para 4-9).
- (7) Install canvas cover (para 4-8).

#### CONTROL PANEL.

ription.

The control panel assembly is mounted on top of the junction box on the lower panel. It contains the three controls by means of which all functions of the air conditioner are controlled. These controls comprise the following: Rotary Selector Switch, Temperature Control Thermostat and a Two-Speed Fan Switch.

#### **WARNING**

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

The following requirements are necessary for organizational maintenance of the control panel.

Test Equipment: Multimeter

Special Tools: None

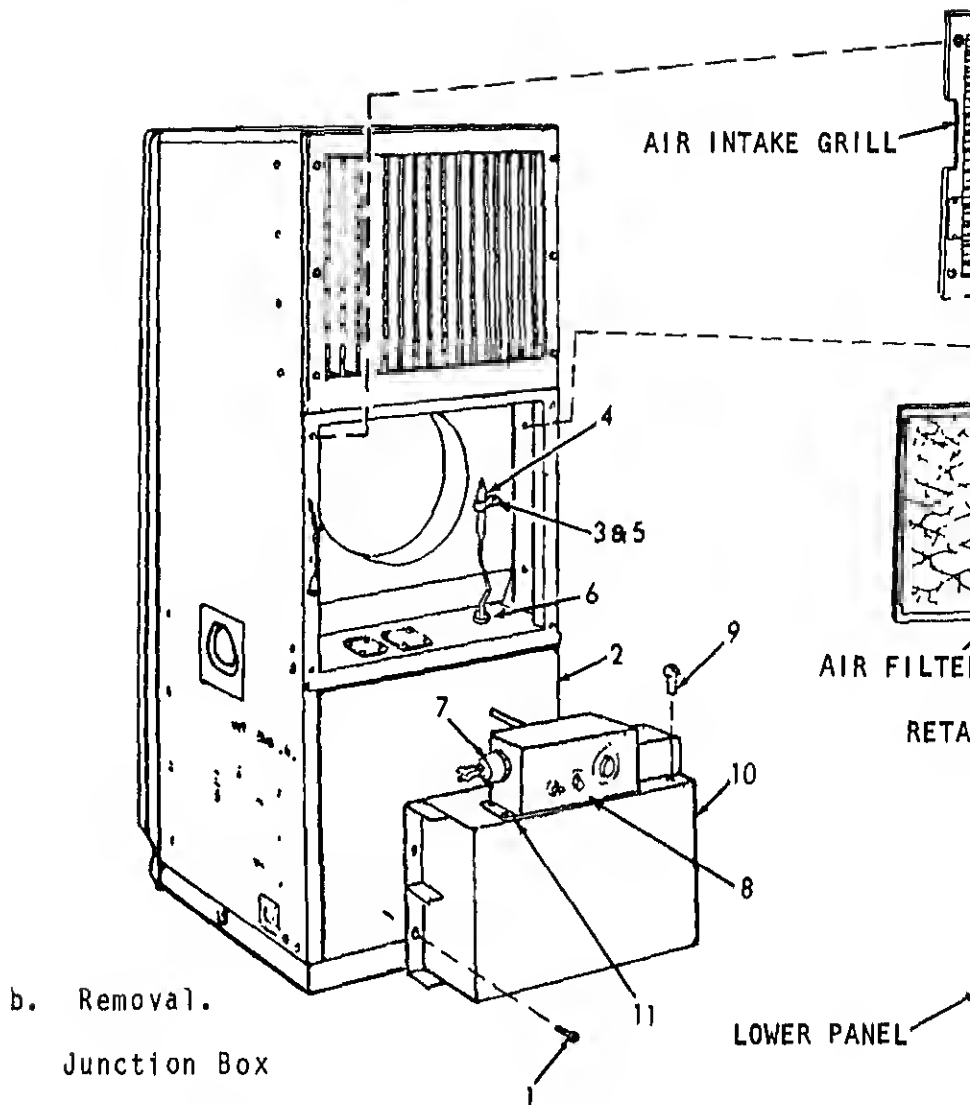
Special Environmental Conditions: None

General Safety Precautions:

- o Disconnect the unit from source of power.

Preliminary Procedures:

- o Remove lower panel (para 4-12).
- o Remove air intake grille (para 4-11).
- o Remove air filter (para 4-18).



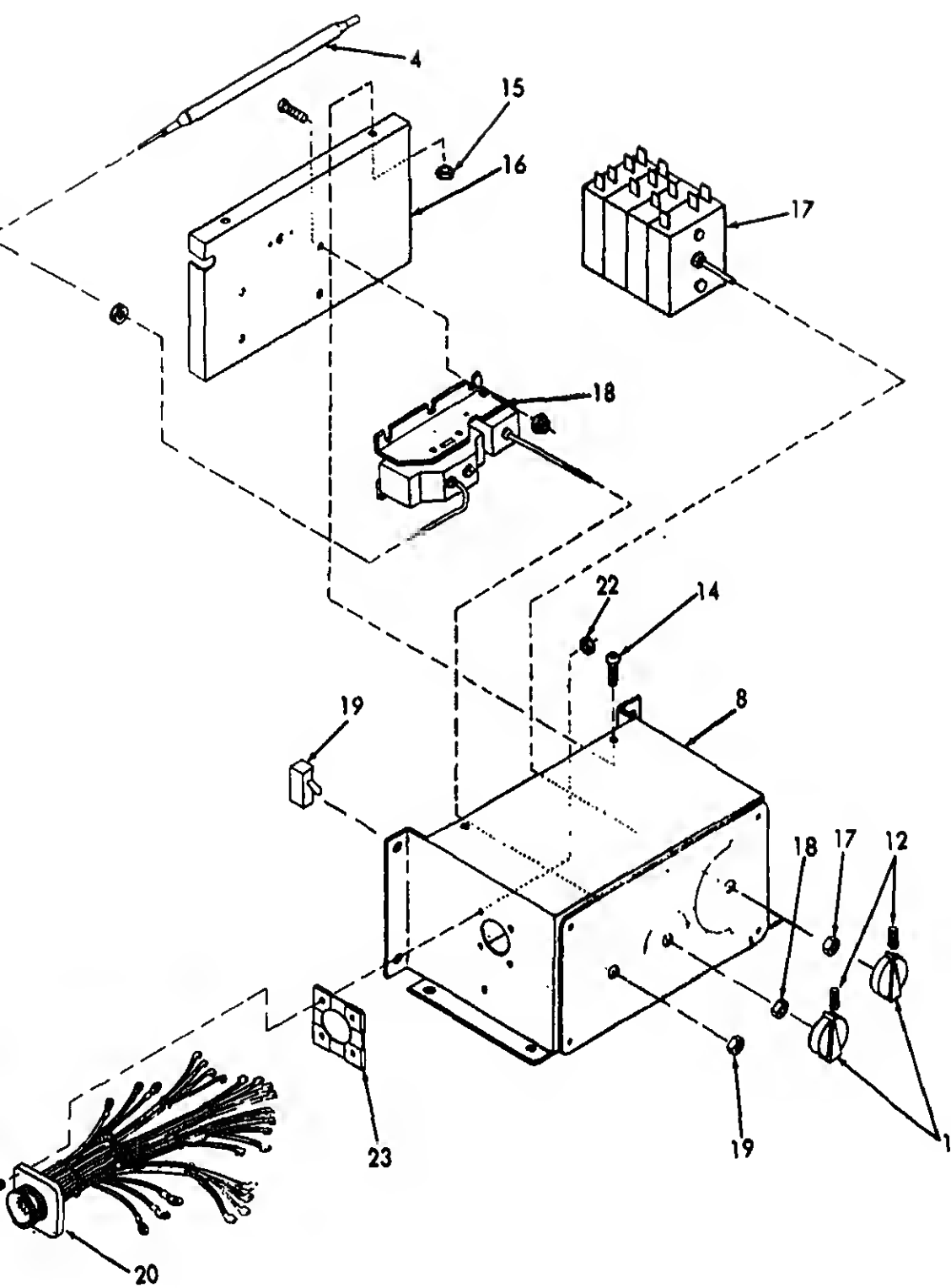
- (1) Loosen fasteners (1) that attach junction box to case (2).
- (2) Move junction box as needed for access.

### CAUTION

Use care to prevent kinking of the thermostat capillary tube when removing thermostat sensor.

## Thermostat Sensing Element

- (1) Loosen screw (3) securing thermostat seal in clamp (5).
- (2) Remove sensing bulb from clamp.
- (3) Slide sensing bulb down through grommet in lower compartment.



### Control Panel

- (1) Unscrew and remove electrical connector (7) from control panel (8).
- (2) Remove screws (9) securing control panel (8) to box (10).
- (3) Remove control panel (8) and gasket (11) from box (10).
- (4) Loosen setscrew (12) in knob (13).
- (5) Remove knob (13) from temperature control knob (13).
- (6) Remove screws (14), nuts (15), and washers (16) from control panel.

### c. Inspection and Repair.

#### Control Panel

- (1) Inspect gasket (11) for damage.
- (2) Replace gasket if damage is indicated.
- (3) Inspect all components and wiring connections for security of attachment.
- (4) Tighten any loose component or wiring connection.

#### Rotary Selector Switch

- (1) Inspect rotary selector switch (17) for damage.
- (2) Test and replace rotary selector switch (17) if it is defective.

#### Temperature Control Thermostat

- (1) Inspect temperature control thermostat (18) for damage.
- (2) Test and replace temperature control thermostat (18) if it is defective.

#### Fan speed (Toggle) Switch

- (1) Inspect toggle switch (19) for damage.
- (2) Test and replace toggle switch (19) if it is defective.

#### Electrical Connector (J7)

- (1) Inspect electrical connector (20) for damage and connections.

2) Repair loose electrical connections as follows:

- (a) Remove screws (21) and nuts (22) securing electrical connector (20) and gasket (23) to control panel (8).

**CAUTION**

Electrical wires are still connected to the electrical connector. Use care when pulling it away from control panel cover.

- (b) Carefully pull electrical connector (20) away from control panel (8).
- (c) Tag and unsolder loose wires from solder wells.
- (d) Insert ends of wires in solder wells.
- (e) Solder (item 12, table E-1) wires in place and remove tags.
- (f) Align holes in electrical connector (20) and gasket (23) with holes in control panel (8).
- (g) Secure electrical connector (20) with screws (21) and nuts (22).

3) Remove Electrical Connector Gasket

- 1) Remove screws (21) and nuts (22) securing electrical connector (20) to control panel (8).

**CAUTION**

Electrical wires are still connected to the electrical connector. Use care when pulling it away from control panel cover.

- (2) Carefully pull electrical connector (20) away from control panel (8).
- (3) Inspect gasket (23) for damage.
- (4) If gasket is damaged, proceed as follows:
  - (a) Tag and remove all control panel wiring harness electrical leads.
  - (b) Completely remove electrical connector (20) and wiring harness from control panel (8).

- (c) Remove gasket (23).
  - (d) Align holes in new gasket and electrical connector (20) with holes in control panel (8).
  - (e) Secure gasket and electrical connector with screws (21) and nuts (22).
- (5) If gasket is NOT damaged, proceed as follows:
- (a) Align holes in gasket (23) and electrical connector (20) with holes in control panel (8).
  - (b) Secure gasket and electrical connector with screws (21), and nuts (22).

#### Knobs

- (1) Inspect knobs for damaged condition.
- (2) If damage is indicated, replace knob with new knob (13).
- (a) Loosen setscrew (12) in knob (13).
- (b) Install new knob (13) and tighten setscrew (12).

#### d. Installation

##### Control Panel Cover

- (1) Align holes in cover (16) with holes in control panel (8).
- (2) Secure control panel cover with screws (15).

##### Control Panel

- (1) Align holes in control panel with holes in control box.
- (2) Secure control panel with screws (9).
- (3) Connect electrical connector (7) to control panel.

#### CAUTION

Use care to prevent kinking of the thermostat sensing bulb when installing thermostat sensing bulb.

## Final Installation

- (1) Install air filter (para 4-18).
- (2) Install air intake grille (para 4-11).
- (3) Install lower panel (para 4-12).
- (4) Install control panel (para 4-24).

## Thermostat Sensing Bulb

- (1) Carefully slide sensing bulb (4) up through grommet (6).
- (2) Install sensing bulb in clamp (5) and tighten screw (3).

## Control Junction Box

- (1) Replace junction box (10).
- (2) Turn turn-button fasteners (1).

## ROTARY SELECTOR SWITCH (S1).

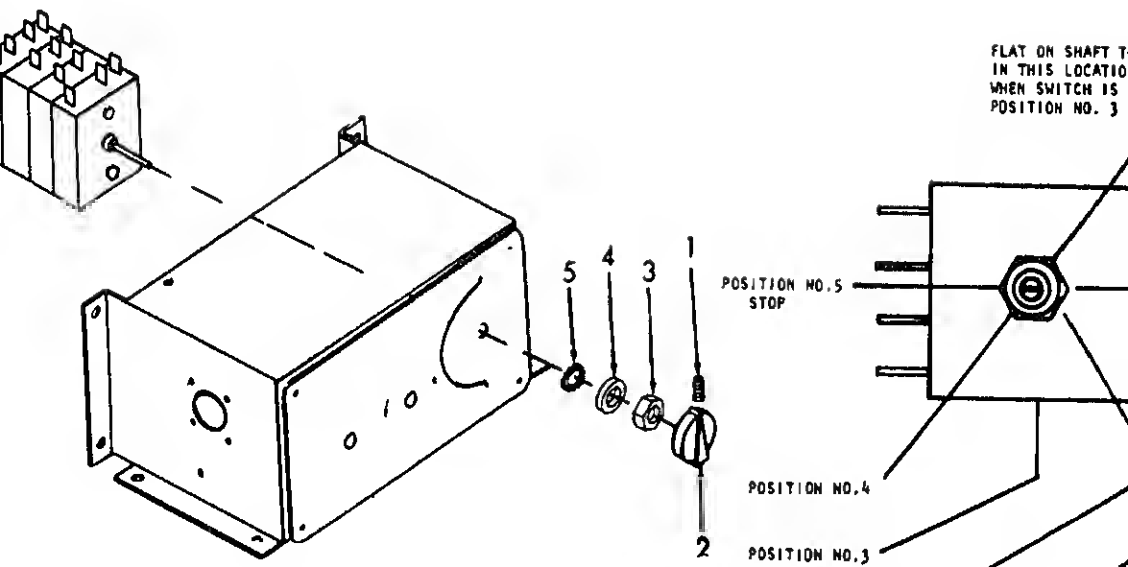
### Description.

The Rotary Selector Switch is a five-position rotary switch consisting of four "wafers" or individual five-position elements. Each position of the switch connects various functional units in each mode of operation.

### Preliminary Procedures:

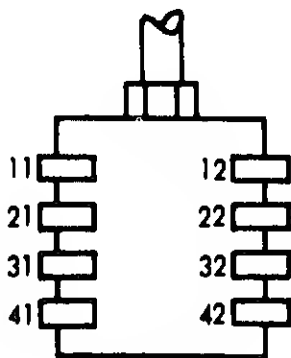
Remove control panel (para 4-24).



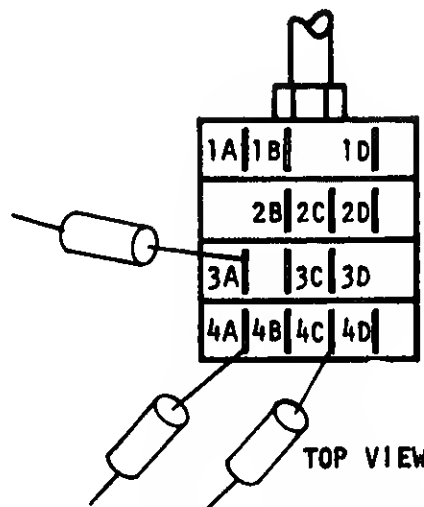


SELECTOR SWITCH POSITION	SWITCH FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED			
		A	B	C	D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 3A	31 AND 3C 32 AND 3A	41 AND 4C 42 AND 4A
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C	
3	OFF				
4	VENT		21 AND 2C 22 AND 2B	31 AND 3C	
5	COOL	12 AND 1B 11 AND 1D	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3B	41 AND 4C 42 AND 4B

WIRING CHART



BOTTOM VIEW



TOP VIEW

al

- (1) Loosen setscrew (1) in selector switch knob (2) and remove knob.
- (2) Remove nut (3), washer (4), and lock-washer (5) securing selector switch to control panel.
- (3) Tag and disconnect electrical leads from selector switch.
- (4) Remove selector switch.

- (1) Turn shaft of selector switch counter-clockwise until stops (POSITION 1).
- (2) Refer to wiring chart and check for continuity between terminals shown for wafers A, B, C and D, Position 1.
- (3) Turn shaft of selector switch clockwise one click to Position No. 2. Check for continuity between terminals shown for wafers A, B, and C, Position 2.
- (4) Turn shaft of selector switch clockwise two clicks to Position No. 4. Check for continuity between terminals shown for wafers B and C Position 4.
- (5) Turn shaft of selector switch clockwise one click to Position No. 5. Check for continuity between terminals shown for wafers A, B, C and D, Position No. 5.

allation

- (1) Connect electrical leads to selector switch and remove tags.
- (2) Install selector switch shaft through hole in control panel.
- (3) Secure selector switch with lockwasher (5), washer (4) and nut (3).
- (4) Install knob (2) and tighten setscrew (1).

1 Installation

- (1) Install control panel (para 4-24).
- (2) Install lower panel (para 4-12).
- (3) Install air filter (para 4-18).
- (4) Install air intake grille (para 4-11).

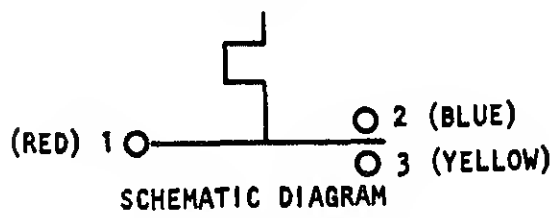
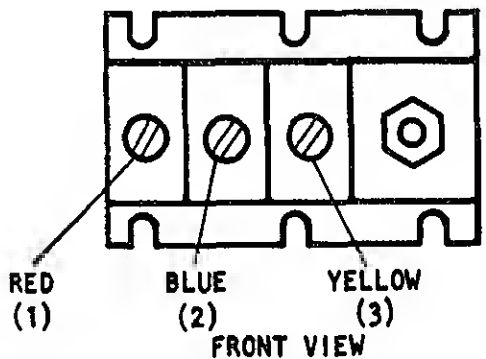
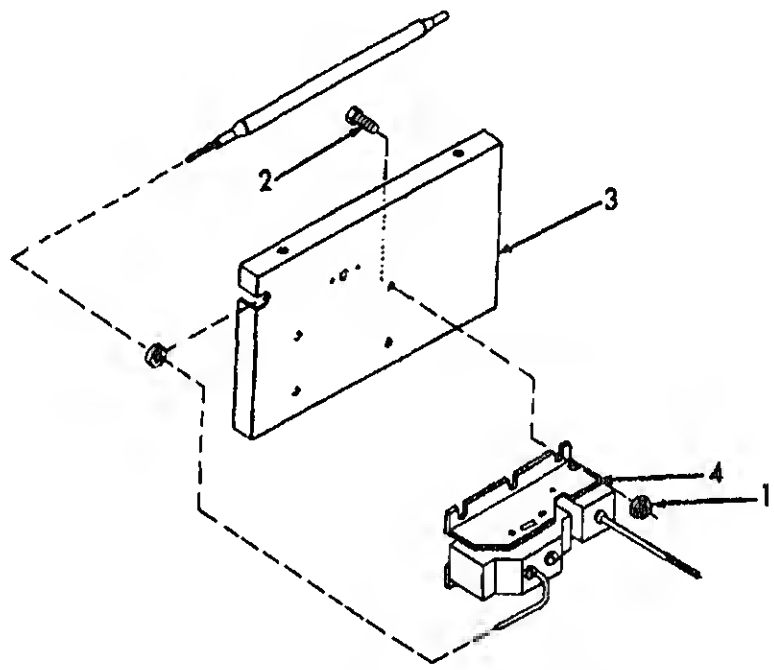
4-26. TEMPERATURE CONTROL AND THERMOSTAT (S2).

a. Description.

The Temperature Control and thermostat is set at the temperature level to heat or cool the conditioned area with a feedback signal from a sensing bulb which causes open or close on temperature rise or temperature drop.

b. Preliminary Procedures:

Remove control panel (para 4-24).



val.

- (1) Tag and disconnect electrical leads from thermostat.
- (2) Remove nuts (1) and screws (2) securing thermostat (4) to control panel.
- (3) Remove thermostat.

ing

#### TEMPERATURE RISE CONTINUITY CHECK

- (1) Place temperature sensing bulb in a container of water at a temperature of  $80^{\circ}$  to  $90^{\circ}\text{F}$  ( $28^{\circ}$  to  $32^{\circ}\text{C}$ ).
- (2) While facing switch shaft, rotate shaft counterclockwise to limit.
- (3) Check continuity between terminal 1 (RED) and terminal (YELLOW). Replace temperature control thermostat if open circuit is found.

#### TEMPERATURE DROP CONTINUITY CHECK

- (1) Place temperature sensing bulb in a container of water at a temperature of  $40^{\circ}$  to  $50^{\circ}\text{F}$  ( $4^{\circ}$  to  $10^{\circ}\text{C}$ ).
- (2) While facing switch shaft, rotate shaft clockwise to limit.
- (3) Check continuity between Terminal 1 (RED) and Terminal (BLUE). Replace temperature control thermostat if an open circuit is found.

allation.

- (1) Connect electrical leads to thermostat and remove tags.
- (2) Attach thermostat (4) with screws (2) and nuts (1) to control panel (3).
- (3) Install control panel (para 4-24).
- (4) Install lower panel (para 4-12).
- (5) Install air filter (para 4-18).
- (6) Install air intake grille (para 4-11).

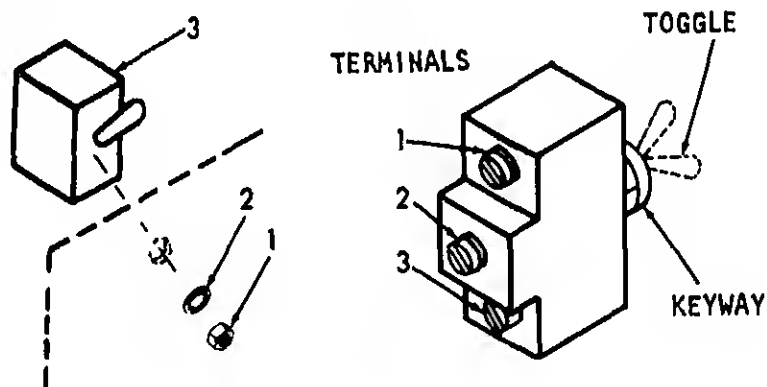
#### 4-27. FAN SPEED SWITCH (S8).

##### a. Description.

This two-position toggle switch connects or disconnects a auxiliary set of windings in the evaporator/condenser fan motor. When connected, these windings double the speed of the motor from 13450 rpm, thereby increasing airflow.

##### b. Preliminary Procedures:

Remove control panel (para 4-24).



##### c. Removal.

- (1) Tag and disconnect electrical leads from toggle switch.
- (2) Unscrew and remove nut (1) and lockwasher (2) securing toggle switch (3) to control panel.

##### d. Testing.

- (1) With keyway in downward position, press toggle switch. Check continuity between Terminals 1 and 2.
- (2) With keyway in upward position, press toggle switch. Check continuity between Terminals 2 and 3.
- (3) Replace two speed switch if an open circuit is indicated.

##### e. Installation.

- (1) Install toggle switch lever through hole in control panel.
- (2) Secure toggle switch (3) with lockwasher (2), and nut (1).
- (3) Connect electrical leads to toggle switch and tag.

- (4) Install control panel para (4-24).
- (5) Install lower panel (para 4-12).
- (6) Install air filter (para 4-18).
- (7) Install air intake grille (para 4-11).

## JUNCTION BOX

Description.

The junction box is located just inside the lower panel. It provides housing or mounting facilities for the electrical components that control the automatic switching of power and control circuits to various operating components of the air conditioner. These components include the control transformer, rectifier, armature relays, thermal relay, the circuit breaker, and associated fuses and terminals.

### WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

The following requirements are necessary for organizational maintenance of the junction box.

Equipment: Multimeter  
Power Supply capable of producing 28 VDC  $\pm$  1V.

Special Tools: None

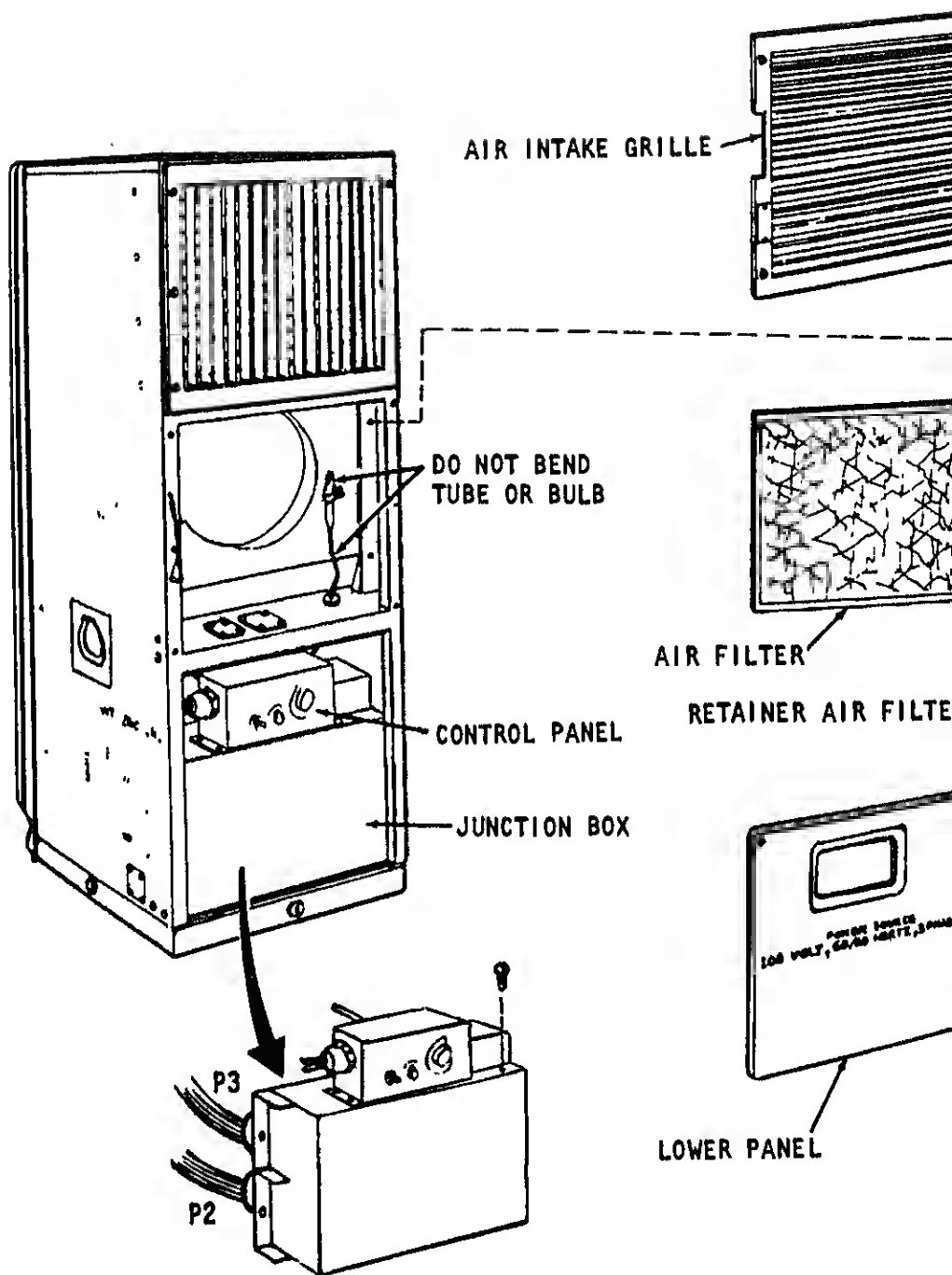
Special Environmental Conditions: None

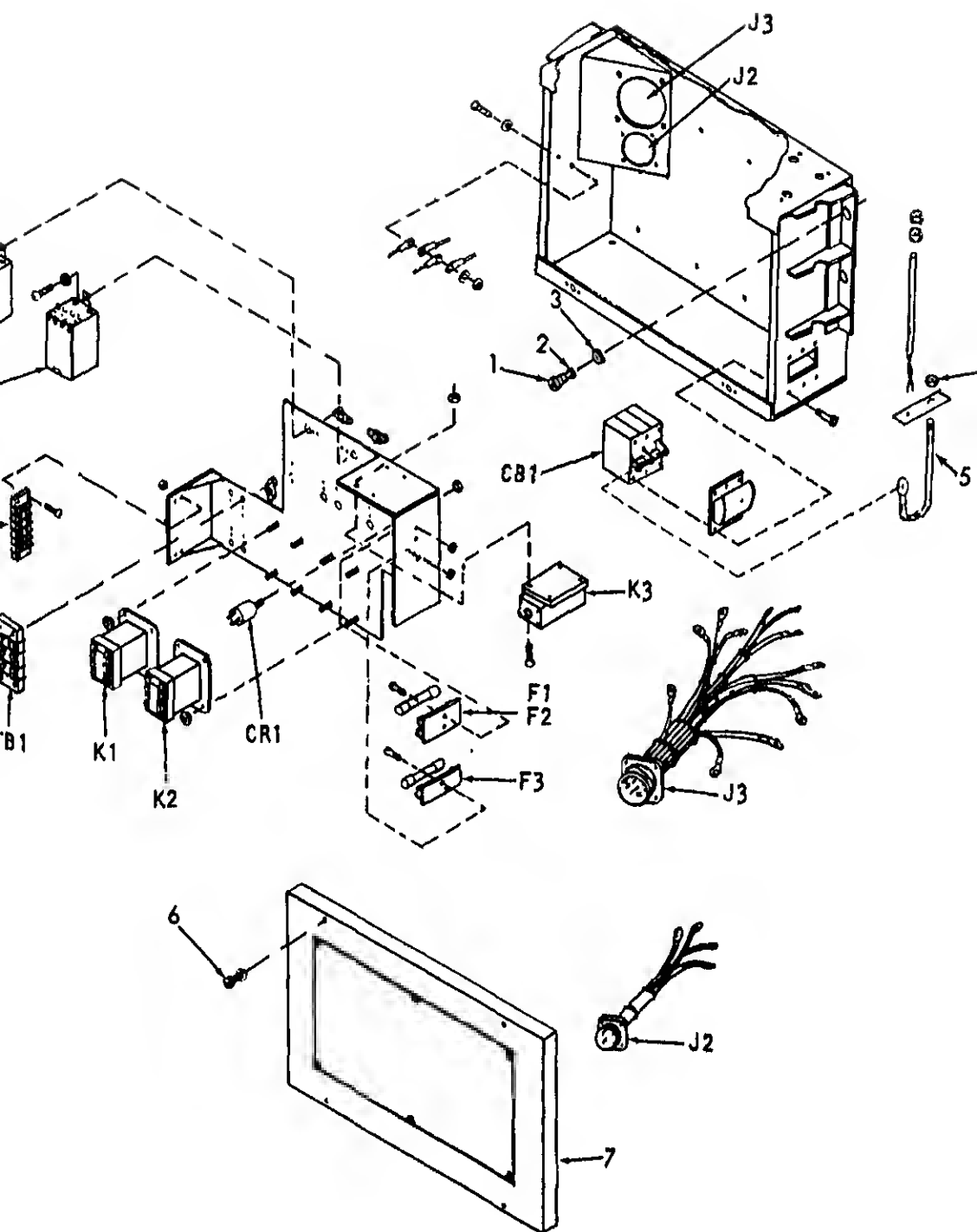
General Safety Precautions:

- (1) Disconnect the unit from source of power.

Preliminary Procedures:

- (1) Remove lower panel (para 4-12).
- (2) Remove air intake grille (para 4-11).
- (3) Remove air filter (para 4-18).







b. Removal.

- (1) Loosen turn-button fastener (1), retaining lockwasher (3) that secure junction box to

**CAUTION**

Do not bend tube or bulb located behind control panel and air filter.

- (2) Pull junction box forward and disconnect (if required).
- (3) Loosen turn-button fasteners that attach to the top of the junction box (if required).
- (4) Remove nut (4) on circuit breaker rod (5).
- (5) Remove junction box (if required).
- (6) Loosen turn-button fasteners (6), and remove

c. Inspection and Repair.

Junction Box

- (1) Inspect all components and wiring for security of attachment.
- (2) Tighten any loose component or wiring

Fuses, F1, F2 and F3

- (1) Inspect fuses F1, F2 and F3 for damage.
- (2) Test and replace fuses (para 4-29) if

Circuit Breaker, CB1

- (1) Inspect circuit breaker and reset if
- (2) Test and replace circuit breaker (para 4-30) if defective.

Heater and Motor Relays, K1, K2, K4, and K5

- (1) Inspect relays for damage.
- (2) Test and replace relays (para 4-31) if they are defective.

Time Delay Relay, K3

- (1) Inspect relays for damage.

(2) Test and replace time delay relay (para 4-33) if it is defective.

former, T1

(1) Inspect transformer for damage.

(2) Test and replace transformer (para 4-35) if it is defective.

Terminal Boards, TB1 and TB2

Refer to paragraph 4-36 and inspect and replace terminal boards as required.

Connectors J3 and J2

Refer to paragraph 4-37 and inspect and replace electrical connectors as required.

Rectifiers CR1 and CR2

(1) Inspect rectifiers for damage.

(2) Test and replace rectifiers (para 4-38) if they are defective.

Installation.

Assembly Box

(1) Align holes in junction box cover (7) with holes in junction box.

(2) Secure junction box cover (7) by tightening turn-buckle fasteners (6).

(3) Connect electrical connector P3 and P2.

(4) Reinstall rod (5) using nut (4).

**CAUTION**

Do not bend tube on rear of control panel.

(5) Align holes in junction box with holes in housing.

(6) Secure junction box with screws (1), washers (2), and lockwashers (3).

(7) Install lower panel (para 4-12).

(8) Install air filter (para 4-18).

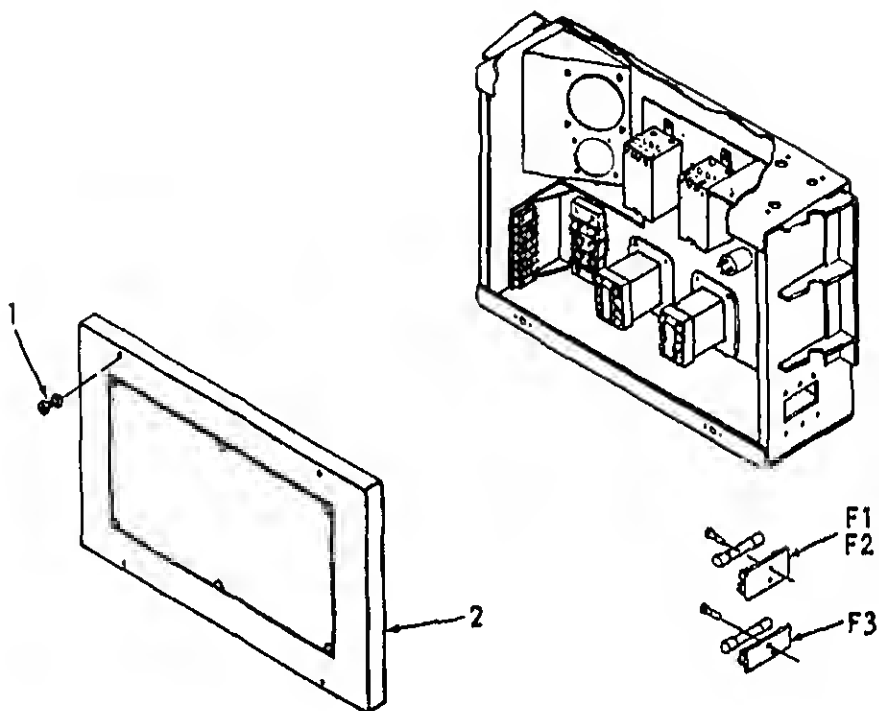
(9) Install air intake grille (para 4-11).

#### 4-29 FUSE REPLACEMENT.

##### a. Preliminary Procedure.

(1) General Procedure (para 4-28).

(2) Remove lower panel (para 4-12).



##### b. Removal.

###### Junction Box

Loosen turn-button fasteners (1) and remove cover (2).

###### Fuses

Remove fuses F1, F2, or F3.

##### c. Test.

Test fuses for continuity. Replace defective

##### d. Installation

(1) Replace defective fuse in accordance with the table:

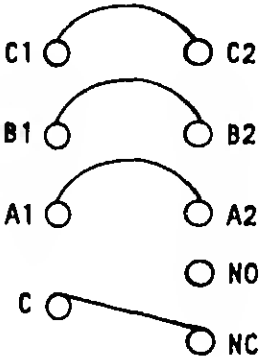
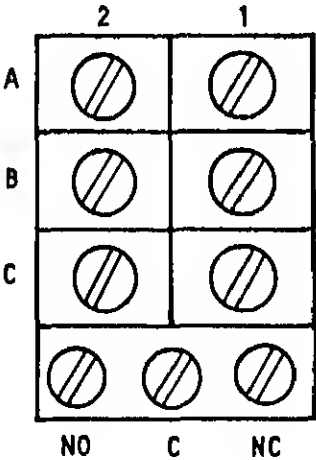
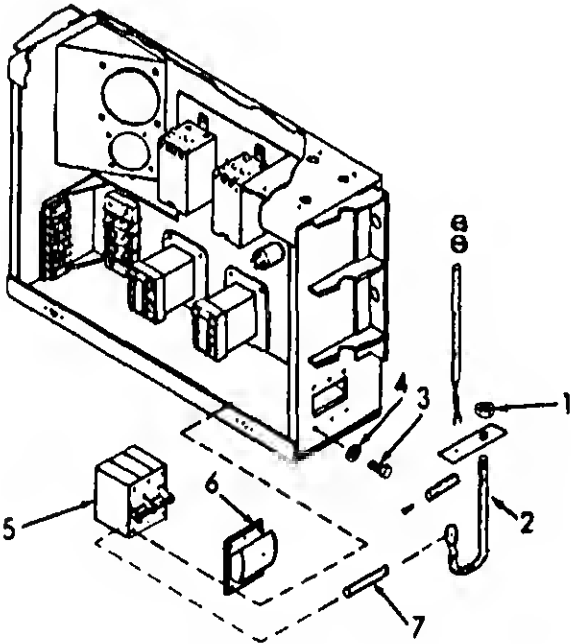
FUSE	AMPS	FUNCTION
F1	10A	AC Voltage to Control Circuits DC Voltage
F2	10A	
F3	5A	

- Align holes in junction box cover (2) with holes in junction box.
- Secure junction box cover (2) by tightening turn-bu fasteners (1).
- Install lower panel (para 4-12).

CIRCUIT BREAKER.

reliminary Procedures.

Remove junction box (para 4-28).



b. Removal.

- (1) Tag and remove all wires from circuit breaker.
- (2) Remove nut (1) on circuit breaker rod (2).
- (3) Remove screws (3) and washers (4) that secure breaker (5) to junction box.
- (4) Remove circuit breaker.
- (5) Remove circuit breaker cover (6).
- (6) Remove connecting pin (7) from circuit breaker.

c. Testing.

CONTINUITY CHECK

- (1) Place the circuit breaker in the ON position.
- (2) Using a multimeter, test for continuity between the following terminals:

C1 and C2  
B1 and B2  
A1 and A2  
C and NO

- (3) Replace circuit breaker if there is no continuity.

SHORT CIRCUIT TEST

- (1) Place the circuit breaker in the OFF position.
- (2) Using a multimeter, test for a short circuit between the following terminals:

C1 and C2  
B1 and B2  
A1 and A2  
C and NO

- (3) Replace circuit breaker if there is a short circuit.

d. Installation.

- (1) Install connecting pin (7) on circuit breaker rod (2).
- (2) Reinstall wires and remove tags.
- (3) Align holes in circuit breaker (5) with holes in circuit breaker cover (6) and junction box.

- (4) Install screws (3) and washers (4).
- (5) Install circuit breaker rod (2) and nut (1).
- (6) Install junction box (para 4-28).
- (7) Install lower panel (para 4-12).

HEATER RELAY (K2).

scription

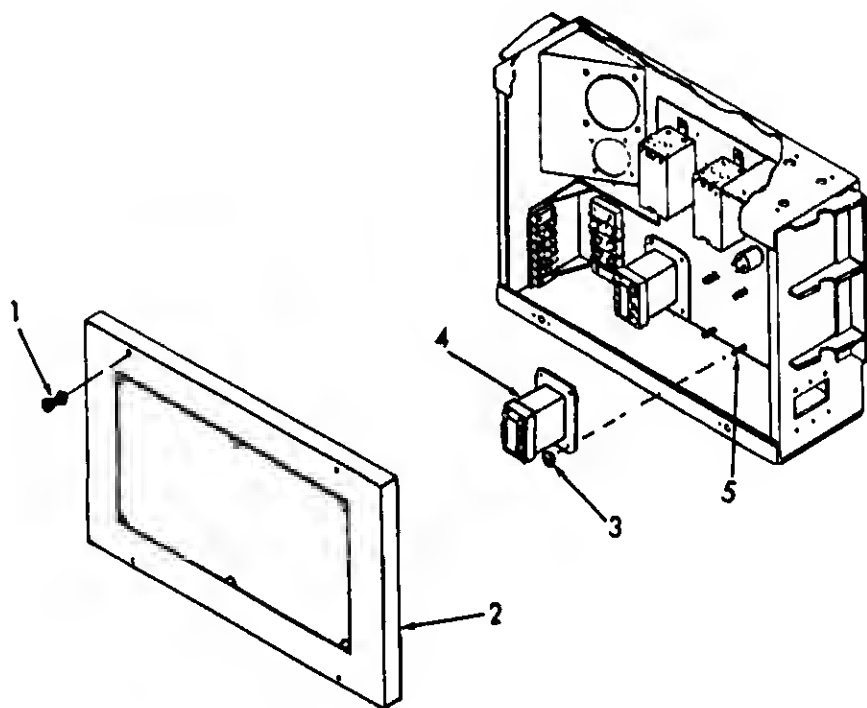
he heater relay (K2) closes to supply power to the electric  
s as called for by the HI-HEAT or LO-HEAT setting of the rot  
or switch (S1).

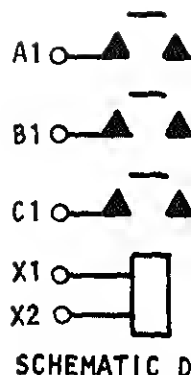
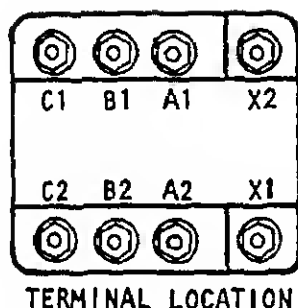
### **WARNING**

Be careful when working with high voltage. Failure to comply can result in serious injury or death.

eliminary Requirements.

- (1) Remove lower panel (para 4-12)
- (2) Remove junction box (para 4-28).





DE-ENERGIZED CHECK FOR CIRCUIT BETWEEN
A1 AND A2 B1 AND B2 C1 AND C2
TABLE A

DE-ENERGIZED CHECK FOR CONTINUITY BETWEEN
X1 AND X2
TABLE B

E C C
A B C

### c. Removal

- (1) Loosen turn-button fasteners (1), and re (2).
- (2) Tag and remove all wires from relay.
- (3) Remove nuts (3) that secure relay (4) to

### d. Testing

- (1) With relay de-energized, check for short terminals shown in Table A. If any short found, replace relay.
- (2) With relay de-energized, check for conti terminals shown in Table B. If any open found, replace relay.
- (3) Energize relay coil between terminals X1 28  $\pm$  1 VDC.

- ) With relay energized, check for continuity between terminals shown in Table C. If any open circuit is found, replace relay.
- ) De-energize relay.
- ) Replace relay if defective.

ation.

- ) Align holes in relay (4) with studs (5) in junction box.
- ) Secure relay with nuts (3).
- ) Install wires and remove tags.
- ) Install front panel (2) and secure with turn-button fasteners (1).
- ) Install lower panel (para 4-12).

RESSOR MOTOR RELAY (K1).

tion.

mpressor start relay operates in conjunction with the timer (K3) and the high- and low-pressure cutout switches (S6) insure proper starting sequence of the refrigerant compressor. Either S6 or S7 require non-operation.

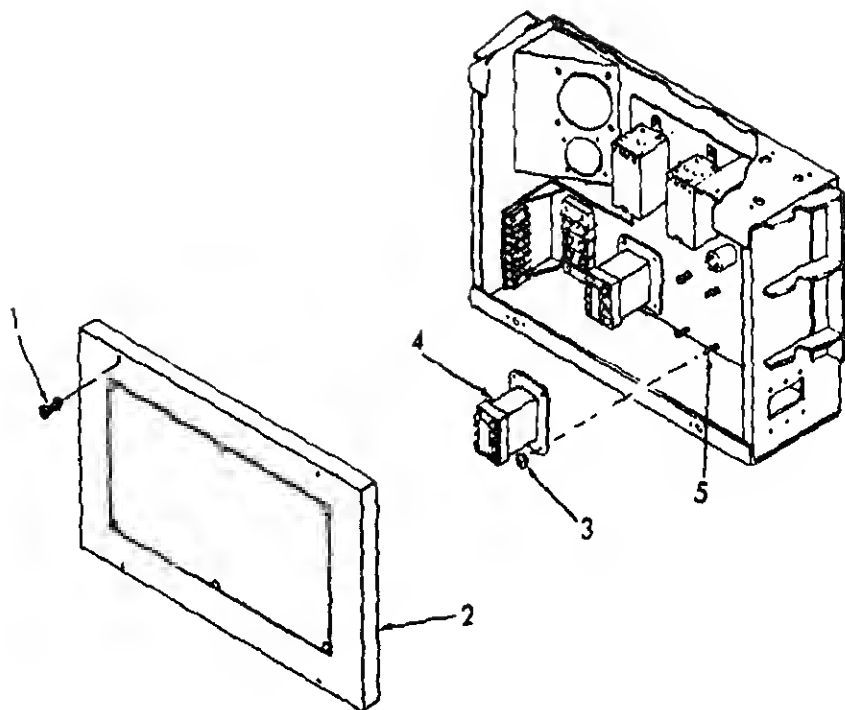
### **WARNING**

Be careful when working with high voltage. Failure to comply can result in serious injury or death.

Primary Requirements.

- ) Remove lower panel (para 4-12).
- ) Remove junction box (para 4-28).





DE-ENERGIZED
CHECK FOR
CIRCUIT
BETWEEN
A1 AND A2
B1 AND B2
C1 AND C2
TABLE A

DE-ENERGIZED
CHECK FOR
CONTINUITY
BETWEEN
X1 AND X2
TABLE B

c. Removal.

- (1) Twist turnbutton fasteners (1) and (2).
- (2) Tag and remove all wires from relay.
- (3) Remove nuts (3) that secure relay.

d. Testing

- (1) With relay de-energized, check for continuity between terminals shown in Table A. If no continuity is found, replace relay.

- IN 5-4120-34
- (2) With relay de-energized, check for continuity between terminals shown in Table B. If any open circuit is found, replace relay.
  - (3) Energize relay coil between terminals X1 and X2 with  $28 \pm 1$  VDC.
  - (4) With relay energized, check for continuity between terminals shown in Table C. If any open circuit is found, replace relay.
  - (5) De-energize relay.

#### Installation

- 1) Align holes in relay (4) with studs (5) in junction box.
- 2) Secure relay with nuts (3).
- 3) Install wires and remove tags.
- 4) Install front panel (2) and secure with turn-button fasteners (1).
- 5) Install lower panel (para 4-12).

#### DELAY RELAY (K3).

#### Operation.

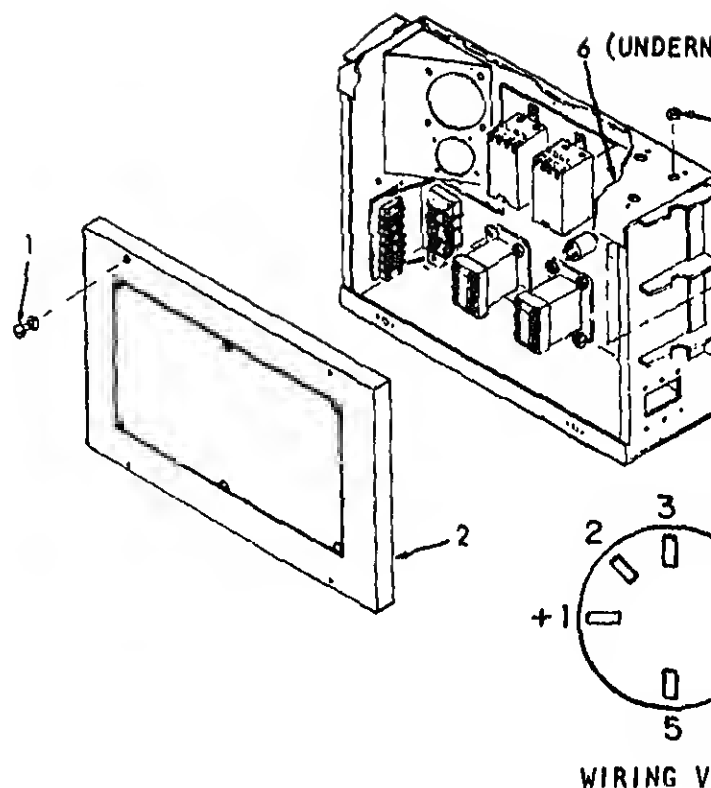
A time delay relay is employed in the start circuit to delay the refrigerant compressor for approximately 30 seconds after the rotary selector switch (S1) has been placed in the COOL position. This allows the fan motor to start and come up to operating speed before the compressor starts, preventing a power overload.

### WARNING

Be careful when working with high voltage. Failure to comply can result in serious injury or death.

#### Removal Requirements.

- 1) Remove lower panel (para 4-12).
- 2) Remove junction box (para 4-28).



c. Removal.

Cover

- (1) Twist Turn-button fasteners (1) and (2).

d. Testing.

- (1) Tag and disconnect wire V14B16 from wire V12B16 from TB2 terminal 2, and relay K1 terminal X1.
- (2) Check for short circuit between wires. Replace relay K3 if any short circuit is found.
- (3) Reconnect wires disconnected in step (1) from wires.

e. Removal.

Relay K3

- (1) Tag and remove all wires from relay K3.
- (2) Remove nuts (3) and screws (4) that hold bracket (5).

# llation

- (1) Align holes in relay (5) with holes in bracket (6).
- (2) Install relay using screws (4) and nuts (3).
- (3) Install wires and remove tags.
- (4) Install front panel (2) and secure with turn-button fastener (1).
- (5) Install lower panel (para 4-12).

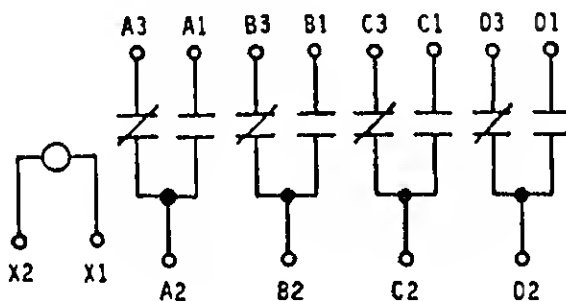
LAY ARMATURE (K4 & K5).

## ip tion.

armature relays (K4 and K5) control electrical power to the lled for by the positioning of the two-speed fan switch. fan switch is in the LO-SPEED position, an increase in r discharge pressure to 400 (+16) psig will close the open pressure switch (S3) and cause the armature relay (K4) placing the fan motor in HI-SPEED. When the discharge drops to 350 (+16) psig, the pressure switch (S3) will open, causing relay (K4) to open and the fan speed will LO-SPEED.

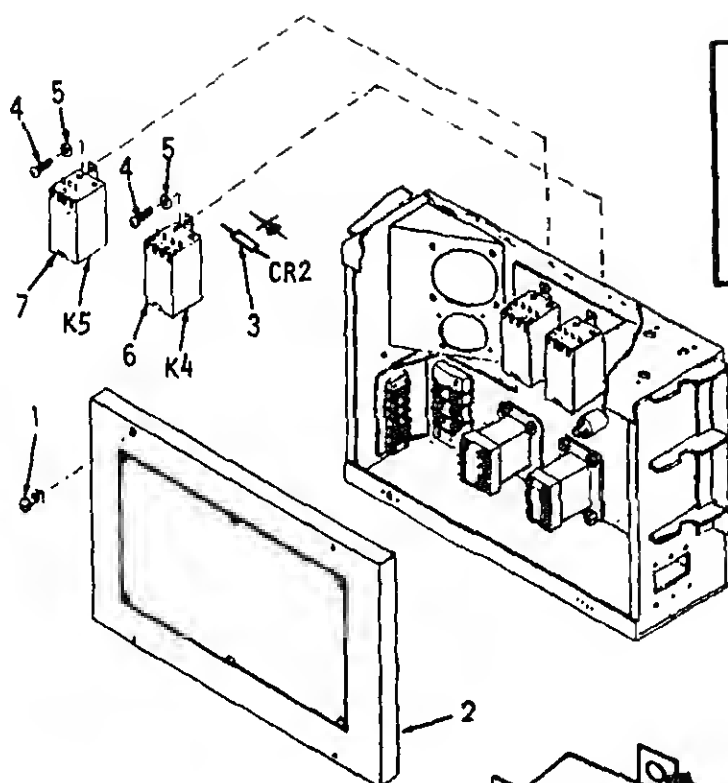
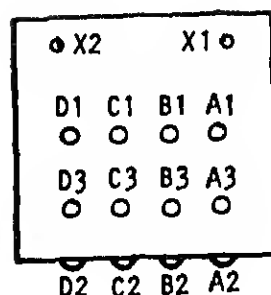
## minary Requirements.

- (1) Remove lower panel (para 4-12).
- (2) Remove junction box (para 4-28).



SCHEMATIC DIAGRAM

## TOP VIEW



SLIDE  
CASE  
DOWN

PULL TAB TO  
RELEASE CASE

MOUNTING  
HOLES

ENERGIZED  
CHECK FOR  
CONTINUITY

AND X2  
AND A3  
AND B4  
AND C5  
AND D6

TABLE A

DE-ENERGIZED  
CHECK FOR  
SHORT CIRCUIT

A1 AND A2  
B1 AND B2  
C1 AND C2  
D1 AND D2  
X1 AND CASE

TABLE B

ENERGIZED  
CHECK FOR  
CONTINUITY

A1 AND A2  
B1 AND B2  
C1 AND C2  
D1 AND D2

TABLE C

ENERGIZED  
CHECK FOR  
SHORT CIRCUIT

A2 AND A3  
B2 AND B3  
C2 AND C3  
D2 AND D3

TABLE D

11.

(1) Twist turn-button fasteners (1) and remove front cover (2).

(2) Tag and remove all wires from relay K4 or K5.

ing.

(1) With relay de-energized, check for continuity between terminals shown in Table A. Replace relay if any open circuit is found.

(2) With relay de-energized, check for short circuit between terminals shown in Table B. Replace relay if any short circuit is found.

(3) Energize relay coil between terminals X1 and X2 with 28  $\pm$  1 volt DC.

(4) With relay energized, check for continuity between terminals shown in Table C. Replace relay if any open circuit is found.

(5) With relay energized, check for short circuit between terminals shown in Table D. Replace relay if any short circuit is found.

(6) De-energize relay.

al.

lay (K4 or K5)

(1) Tag and remove all wires from relay.

(2) Relay K4 - Remove diode CR2 (3).

(3) Remove screws (4), and washers (5).

(4) Remove relays (6 or 7).

llation.

(1) Align holes in relay (6 or 7) with holes in junction box.

(2) Install screws (4) and washers (5).

(3) Install diode (3) on relay K4. Refer to figure for orientation.

(4) Install wires and remove tags.

(5) Install front panel (2) and secure with the fasteners (1).

(6) Install lower panel (para 4-12).

#### 4-35. TRANSFORMER (T1).

##### a. Description.

The transformer reduces the 208 vac input electrical (+3%) vac required by the rectifier. It is mounted on the external panel of the junction box, adjacent to the control panel.

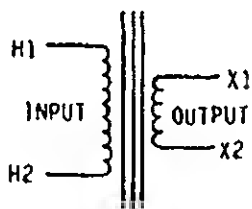
##### b. Preliminary Requirements

(1) Remove lower panel (para 4-12).

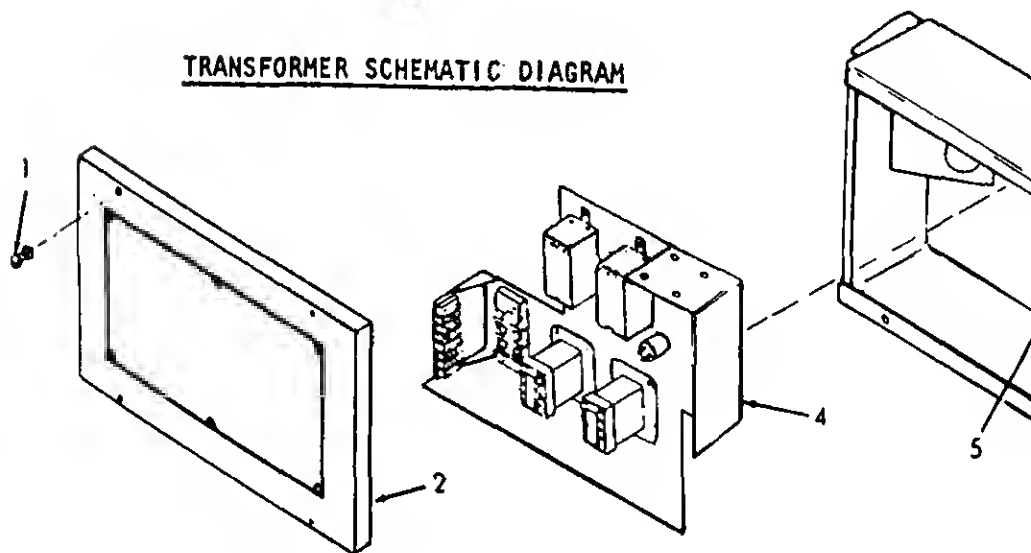
(2) Remove junction box (para 4-28).

### WARNING

Be careful when working with high voltage. Failure to comply can result in serious injury or death.



TRANSFORMER SCHEMATIC DIAGRAM



oval.

#### Cover

- (1) Twist turn-button fasteners (1) and remove front cover (2).

#### Panel

- (1) Remove screws (3) that attach panel (4) to junction box.
- (2) Carefully pull the panel out of the junction box so that access to the transformer base is obtained.

#### Transformer

- (1) Remove nuts (5).
- (2) Raise transformer (6) to gain access to wiring.
- (3) Tag and remove wires.
- (4) Remove transformer (6) and gasket (7).

#### Testing.

- (1) Check for continuity between terminals H1 and H2. Replace transformer if any open circuit is found.
- (2) Check for continuity between terminals X1 and X2. Replace transformer if an open circuit is found.
- (3) Check for short circuit between terminals H1 and X1. Replace transformer if a short circuit is found.
- (4) Check for short circuit between terminals H1 and the transformer case. Replace transformer if a short circuit is found.
- (5) Check for short circuit between terminals X1 and the transformer case. Replace transformer if a short circuit is found.

#### Installation.

- (1) Place gasket (7) on transformer (6).
- (2) Install wires and remove tags.
- (3) Place transformer and gasket on junction box.
- (4) Install nuts (5).
- (5) Carefully install the panel into the junction box.



(7) Install front panel (2) and secure with fasteners (1).

(8) Install junction box (para 4-28).

(9) Install lower panel (para 4-12).

#### 4-36. TERMINAL BOARDS (TB1 & TB2).

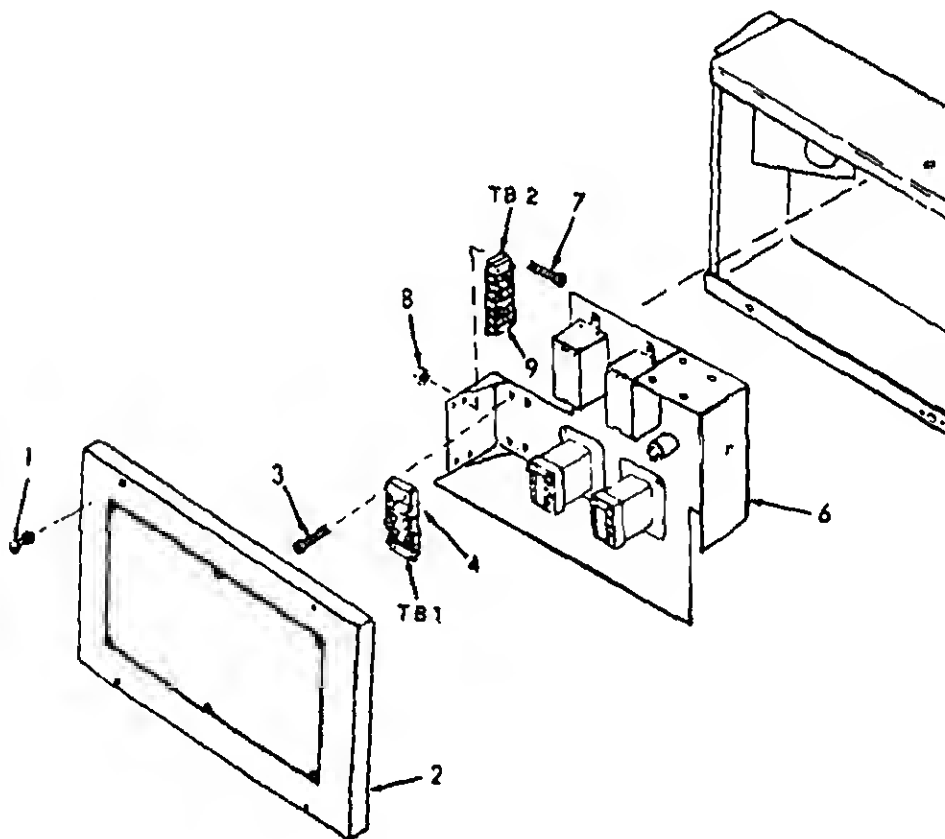
##### a. Description.

There are two terminal boards mounted in the lower part of the junction box. Electrical power is distributed through the terminal boards to all electrical components of the system. All terminal boards are removed and installed in a systematic manner.

##### b. Preliminary Requirements.

(1) Remove Lower panel (para 4-12).

(2) Remove junction box (para 4-28) (for removal only).



ver

Loosen turn-button fasteners (1) and remove front cover (2).

1

) Tag and remove wires.

) Remove screws (3).

) Remove terminal board (4).

2

) Tag and remove wires.

) Remove screws (5) that attach panel (6) to junction box.

) Carefully pull the panel out of the junction box so that access to TB-2 mounting nuts is obtained.

) Remove nuts (8) and screws (7).

) Remove terminal board (9).

ion.

t terminal boards for cracks, breaks, and damaged

ation.

1

) Align terminal board (4) with holes in junction box.

) Install screws (3).

) Install wires and remove tags.

2

) Align terminal board (9) with holes in junction box.

) Install screws (7) and nuts (8).

) Install wires and remove tags.

) Carefully install the panel into the junction box.

) Install screws (5) that attach panel (6) to junction b

(6) Install front panel (2) and secure with the fasteners (1).

(7) Install junction box (para 4-28) if required.

(8) Install lower panel (para 4-12).

#### 4-37. RECEPTACLES.

##### a. Preliminary Requirements.

(1) Remove lower panel (para 4-12).

(2) Remove junction box (para 4-28).

##### b. Inspection.

(1) Inspect for deformation, damaged threads and broken washers.

(2) Check continuity from each pin of the connector to the terminal end of its associated wire lead. Continuity should exist.

(3) Check continuity from each pin to the shell of the connector. Continuity should not exist.

(4) Replace the receptacles if they indicate that continuity requirements are not met.

##### c. Replacement.

(1) Replacement is easily accomplished as part of a harness repair, refer to para 4-45.

#### 4-38. RECTIFIER ASSEMBLY (CR1).

##### a. Description.

The rectifier is located on the center right side of the control box. It changes 30-volt alternating current to 30-volt direct current for operation of the armature relays, compressor start relay, delay relay and solenoid valves.

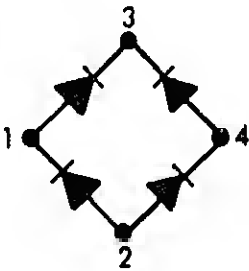
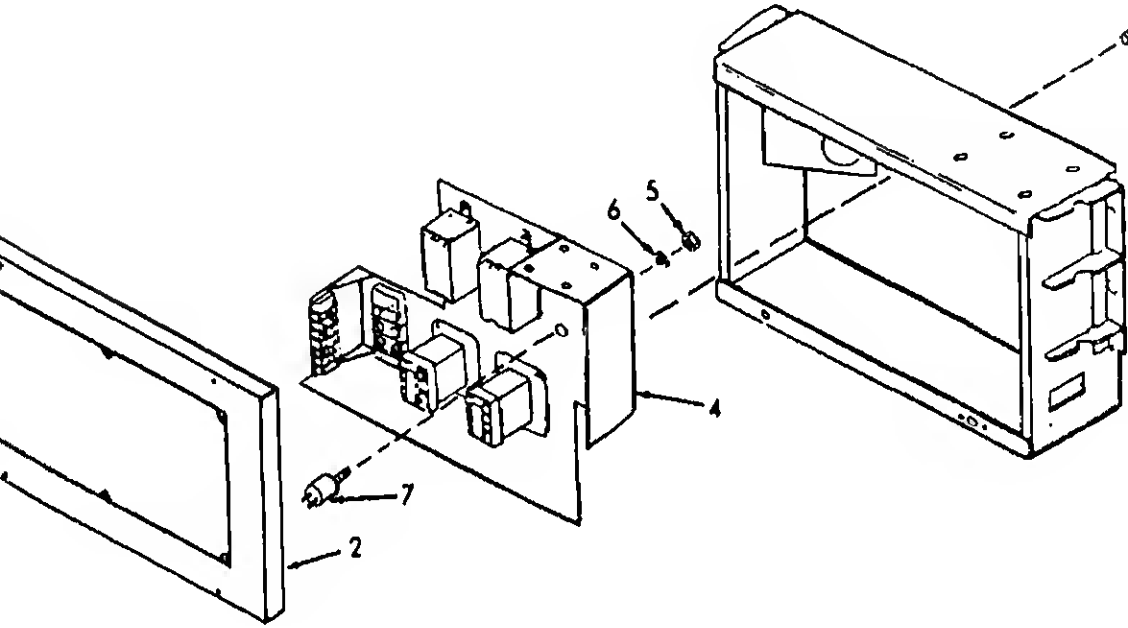
##### b. Preliminary Requirements.

(1) Remove lower panel (para 4-12).

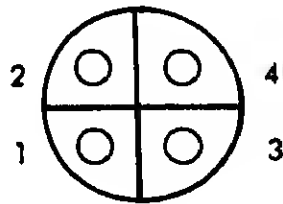
(2) Remove junction box (para 4-28).

# **WARNING**

Be careful when working with high voltage. Contact with high voltage can result in serious injury or death.



SCHEMATIC



RECTIFIER  
WIRING VIEW

removal.

Cover

Twist turn-button fastener (1) and remove cover (2)

d. Testing

- (1) Tag and remove all wires from rectifier.
- (2) Using a multimeter test for continuity as fo

Low Resistance

1 to 3  
4 to 3  
2 to 1  
2 to 4

High Resistance

3 to 1  
3 to 4  
1 to 2  
4 to 2

- (3) Replace rectifier if found defective.

e. Removal.

CR1

- (1) Remove screws (3) that attach panel (4) to junction box.
- (2) Carefully pull the panel out of the junction box. access to the back of the panel is obtained.
- (3) Remove nut (5) and washer (6).
- (4) Remove rectifier (7).

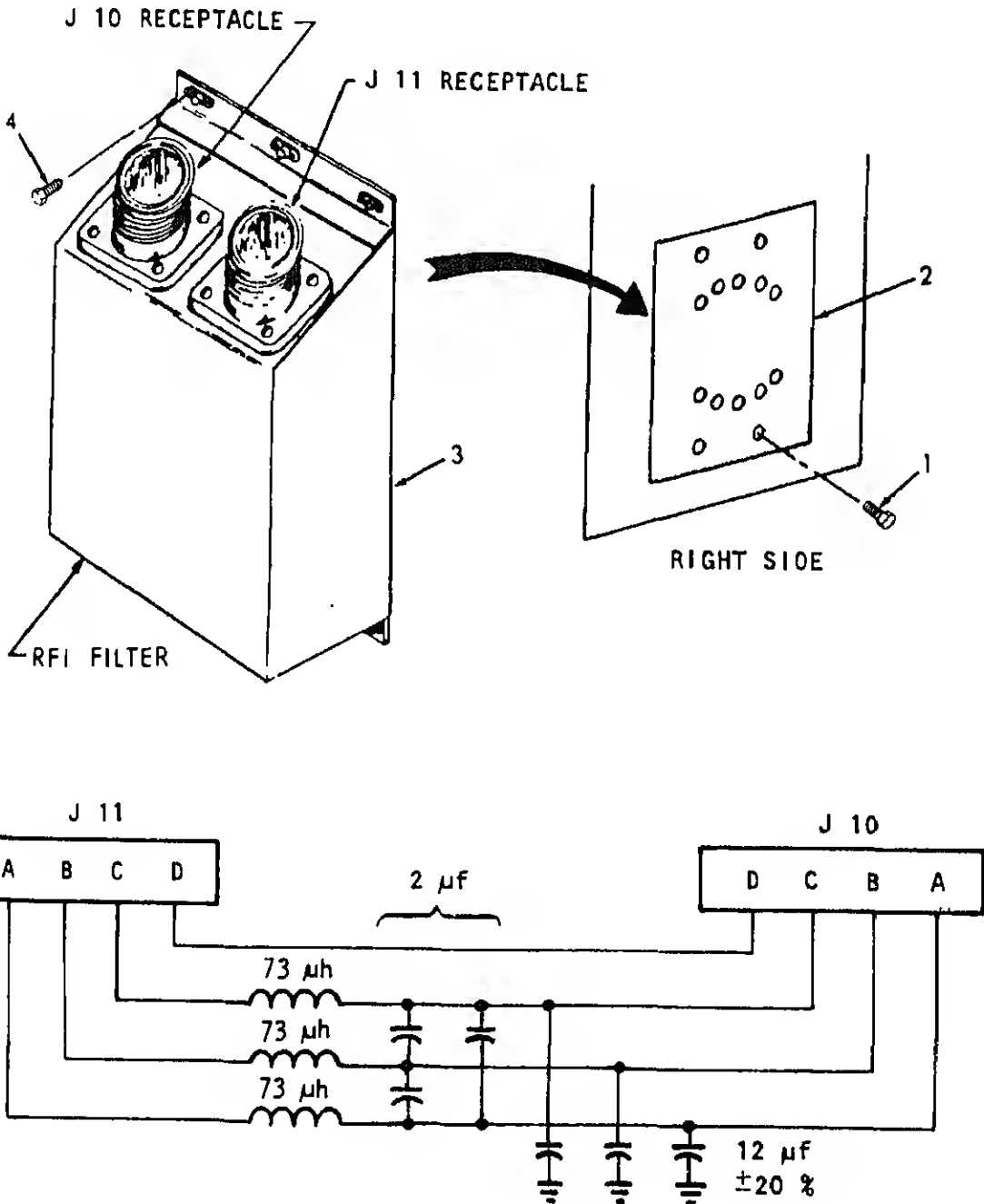
f. Installation.

- (1) Insert rectifier (7) in panel (4).
- (2) Install washer (6) and nut (5).
- (3) Carefully insert panel (4) into junction box.
- (4) Secure panel (4) with screws (3).
- (5) Install front panel (2) and secure with turn-bushings(1).
- (6) Install junction box (para 4-28).
- (7) Install lower panel (para 4-12).

RFI FILTER ASSEMBLY.

escription.

Suppression of radio frequency interference (RFI) is attained by providing a low-resistance path to ground for stray currents. Methods used include shielding the ignition and high-frequency components, bonding the frame with bonding straps, and using capacitors and inductors. The air conditioner's RFI filter consists of a 73  $\mu$ h inductor in series with each phase, and capacitors between phases and between each phase and ground.



**WARNING**

Disconnect power from the air conditioner performing maintenance on electrical components. The voltage used can be lethal.

**b. Removal.**

- (1) Remove screws (1) from the filter mounting plate.
- (2) Pull the filter housing (3) and mounting plate outward as far as possible, and disconnect plugs, P10 and P11, from receptacles on the filter housing.
- (3) Remove screws (4) near the top and bottom of the mounting plate to release the filter housing. Separate the housing from the mounting plate.

**c. Inspection.**

- (1) Inspect the housing and mounting plate for damage such as dents, punctures or cuts.
- (2) Look for evidence of overheating, or burn marks, potting compound, arcing at terminals, etc.
- (3) Check continuity between connector pins and the following table.

From receptacle J10, pin	To receptacle J11, pin
A	A
A	B
A	C
A	D
B	B
B	C
B	D
C	C
C	D
D	D

## NOTE

Continuity testing does not necessarily predict the behavior of capacitors under load. If the filter still does not operate properly after passing the continuity test, substitute a filter known to be good, and replace the defective RFI Filter Assembly.

## Installation

- (1) Position the filter housing (3) on the mounting plate (2) using screws (4).
- (2) Install connectors P10 and P11.
- (3) Install mounting plate (2) using screws (1).

## COMPRESSOR

The refrigeration compressor is a self-contained unit which contains a reciprocating compressor, a drive motor and a lifter of oil hermetically sealed into a dome-shaped steel housing. A resistance type crankcase heater is mounted around the outside of the compressor housing near the base. Organizational Maintenance tasks are limited to testing of compressor and testing and replacing of crankcase heater.

## COMPRESSOR TEST

### WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

## Preliminary Requirements

Remove junction box (para 4-28).

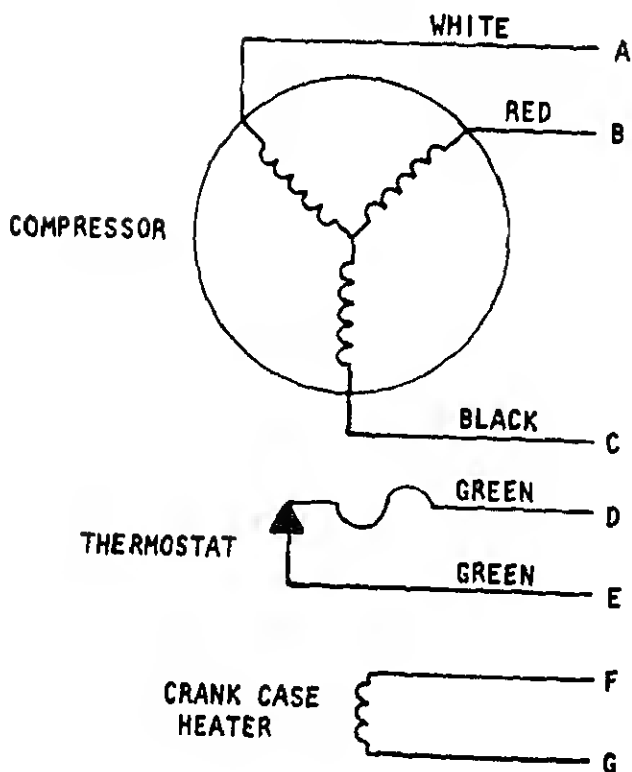
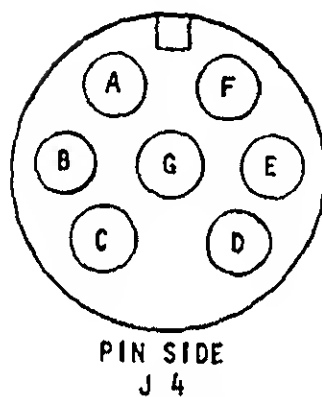
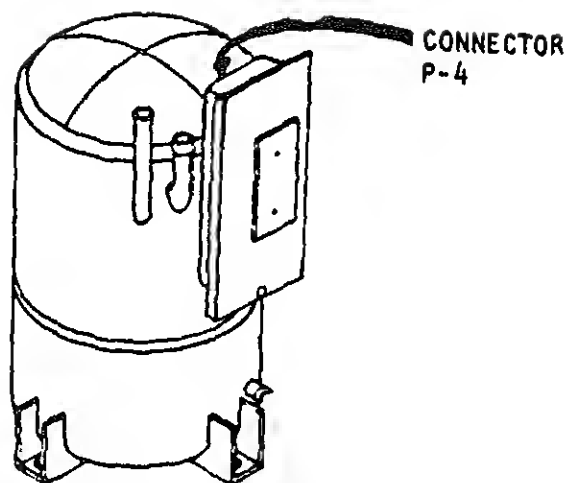
## Special Tools.

## Multimeter

## Removal.

To gain access to the compressor the harnesses to the compressor junction box may be removed.





pection/Test.

- (1) Inspect the compressor for damage and loose mounting bolts. If damage is evident, refer to Direct Support Maintenance.
- (2) If mounting bolts are loose, tighten them. If electrical trouble is indicated, check continuity follows:
- (3) Disconnect plug, P4, from the electrical junction on the compressor.
- (4) Using a multimeter check for continuity on receptacle J4.

Compressor Motor

A to B  
B to C  
A to C

Thermal Overload

D to E

Crankcase Heater

F to G

- (5) Using a multimeter check for a lack of continuity between receptacle J4 and compressor housing. A, D, and housing.
  - (6) If there is no continuity between F and G, replace crankcase heater.
  - (7) If the continuity requirements are not met for A, and C or D and E, refer to Direct Support Maintenance.
- air.

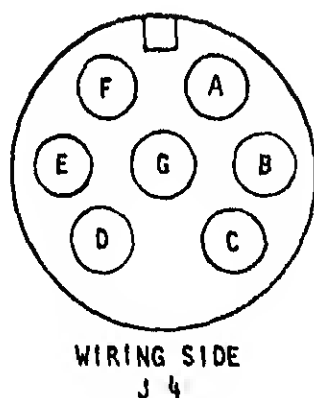
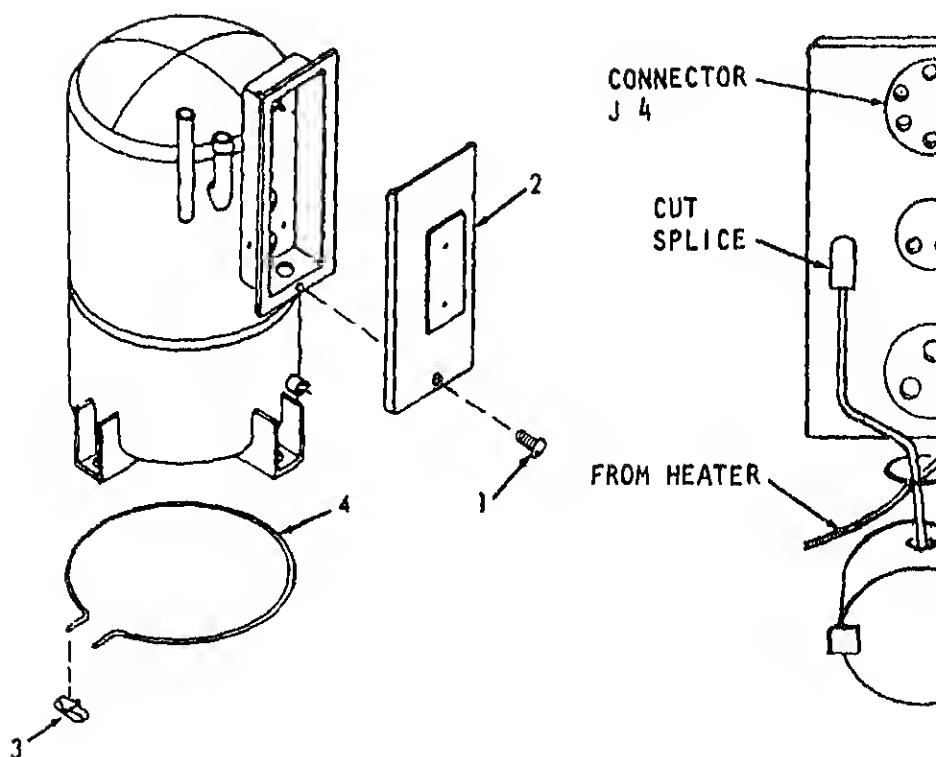
Repair is limited to crankcase heater only (para 4-40.2).

CRANKCASE HEATER.

Description.

A resistance type crankcase heater is mounted around the compressor housing near the base. The purpose of the crankcase heater is to prevent migration of liquid refrigerant into the compressor in cold weather. Liquid refrigerant could mix with the oil, causing the oil to be pumped throughout the system.

(2) Remove junction box (para 4-28).



c. Removal.

- (1) Remove screw (1) then compressor junction box (2).
- (2) Unsolder wire lead from heating element terminal pin G and cut splice to heater thermostat.

- (3) Remove the retaining spring (3) from the ends of the crankcase heating element (4).
- (4) Spring the ends of the heating element (4) apart slightly so that the heating element can be maneuvered around and over the top of the compressor housing to remove it.

ction or Test.

- (1) Inspect heating element for damage.
- (2) Test heating element as per para 4-40.2.

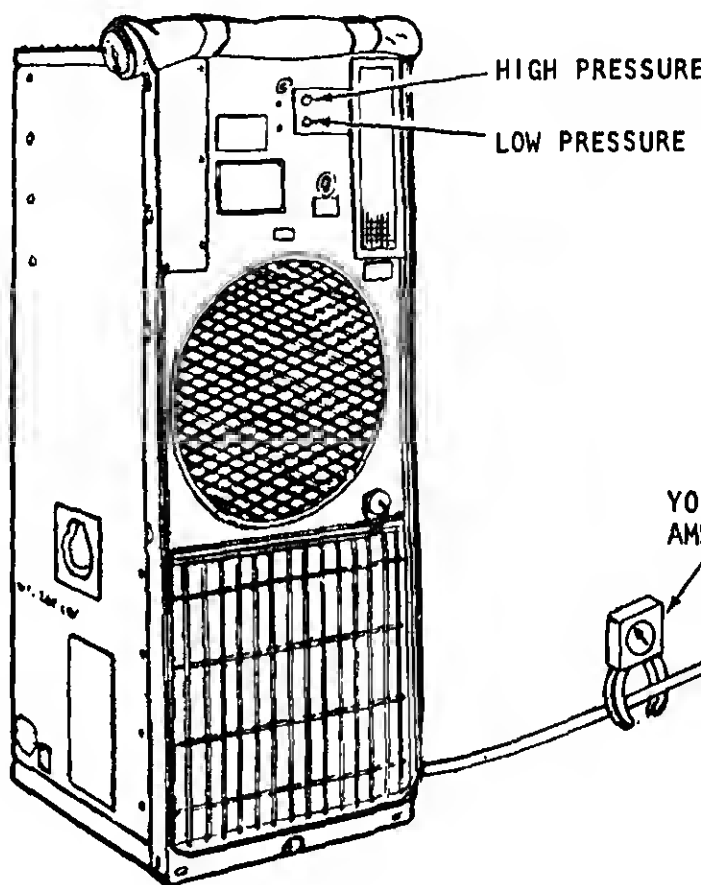
llation.

- (1) Maneuver the crankcase heating element (4) over the top of the compressor, and down to the lower part of the compressor housing. Do not spread the ends of the heating element any more than necessary. Install retaining spring (3) over both ends of the heating element (4) to hold it in position.
- (2) Lead electrical wires from heating element (4) into compressor junction box. Slide a one-inch length of heat-shrink tubing over one wire lead, and solder wire to pin G of receptacle with solder (item 12, table B). Slide heat-shrink tubing over connection, and heat with a match to shrink in place. Splice the other heater lead to the thermostat lead and insulate as necessary.
- (3) Install cover (2) on junction box using screw (1).
- (4) Install plug P4.
- (5) Install junction box (para 4-28).
- (6) Install lower panel (para 4-12).

ESSURE SWITCHES.

pressure switches are of two types, a high/low pressure switch and a pressure control switch. Organizational Maintenance is limited to testing of the pressure switches, for replacement refer to Direct Support Maintenance in Chapter 5.

The high-pressure and the low-pressure cutout switches are protective devices which interrupt electrical power to the compressor whenever refrigerant system pressure becomes too high or too low to permit safe, efficient operation. The pressure cutout switches are made by means of capillary tubes to the high and suction side of the compressor. Electrically, they are connected in series between the rotary selector switch and the compressor. Both switches are equipped with manual reset buttons. The pressure cutout switches are located next to the fresh air screen on the back of the air conditioner.



b. Test.

Check electrical operation of the pressure cutout switches in the following manner.

- (1) With the air conditioner operating in the cooling mode, install a yoke-type ammeter around the power supply cable. Note the reading.

- (2) Press then release each of the pressure cutout reset buttons while watching the ammeter. The ammeter reading should drop when each reset button is pressed and return to its original reading when the button is released.
- (3) If the ammeter does not respond when each button is pressed and released, refer to Direct Support Maintenance for replacement.

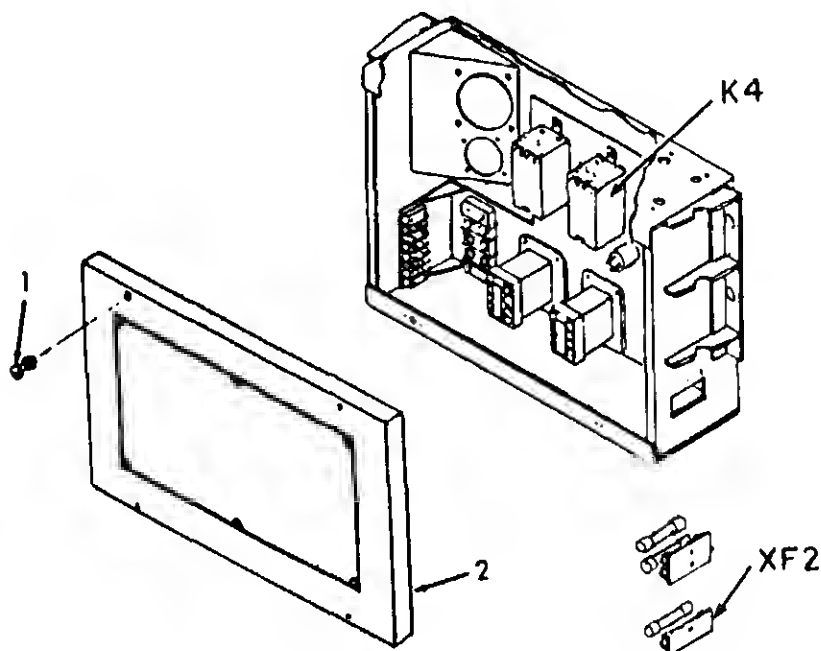
## 2 PRESSURE CONTROL SWITCH (FAN SPEED).

### Description.

The pressure switch (fan speed) is installed to sense compressor discharge pressure. When the air conditioner is operated with the fan speed switch in the LO-SPEED position, an increase in compressor discharge pressure to 400 (+16) psig (281.2 +11.2 kg cm<sup>2</sup>) will actuate the normally open pressure switch (S3), causing the switch to close and the fan speed to increase to HI-SPEED. When the discharge pressure drops to 350 (+16) psig, (246.1 +10.5 kg cm<sup>2</sup>) the pressure switch (S3) contacts will return to normally open and the fan speed will return to LO-SPEED.

### Preliminary Requirements.

Remove lower panel (para 4-12).



c. Removal.

Loosen turn-button fasteners (1) and remove f (2).

d. Testing.

Check for continuity between terminals 2 of f (XF2) and X2 of armature relay (K4). Continuity should not be indicated. If continuity is in switch is defective and must be replaced.

e. Replacement.

Refer to Direct Support Maintenance for pressure contr replacement.

4-42. REFRIGERANT COMPONENTS.

The refrigerant components limited to Organizational M consist of two solenoid valves that can be tested and if ne coils replaced. Inspection of the sight glass is required. addition there is servicing of the condenser coil and evapo coil.

4-42.1 LIQUID LINE SOLENOID VALVE L1.

a. Description.

The liquid line solenoid valve is used to close/open t refrigerant line from the condenser coil to the evaporator expansion valve. The liquid line solenoid valve is located behind the filter-drier in the lower part of the unit

NOTE

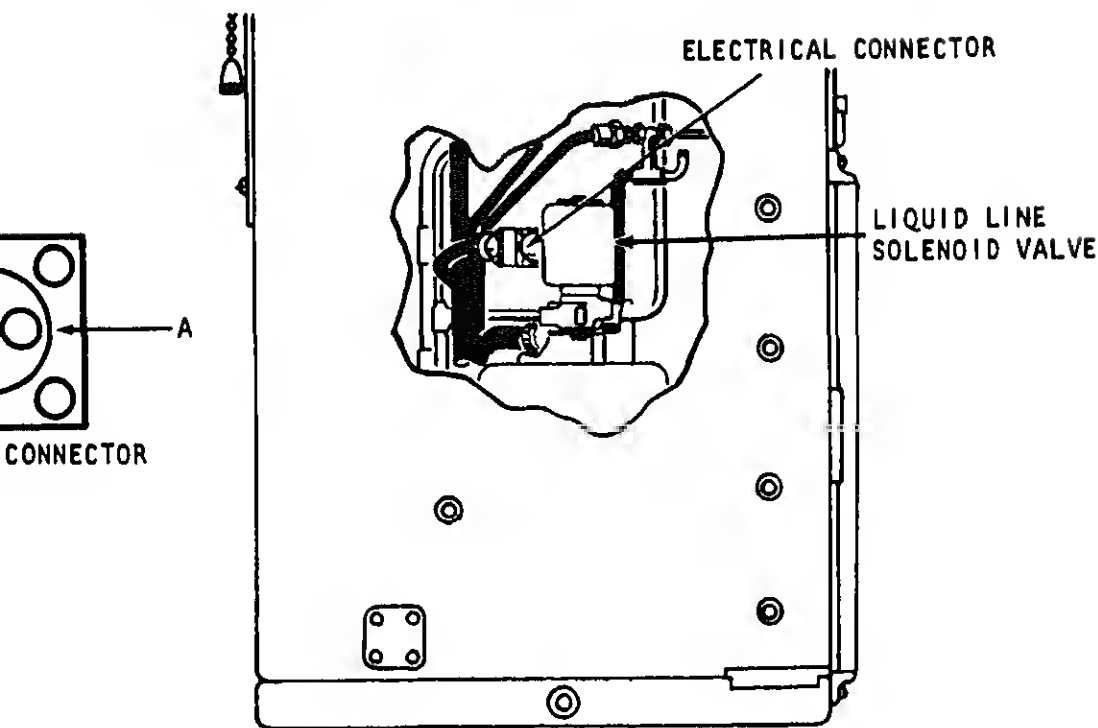
A source of 24 to 28 vdc is required to perform t following test.

b. Preliminary Requirements.

(1) Removal of lower panel (para 4-12).

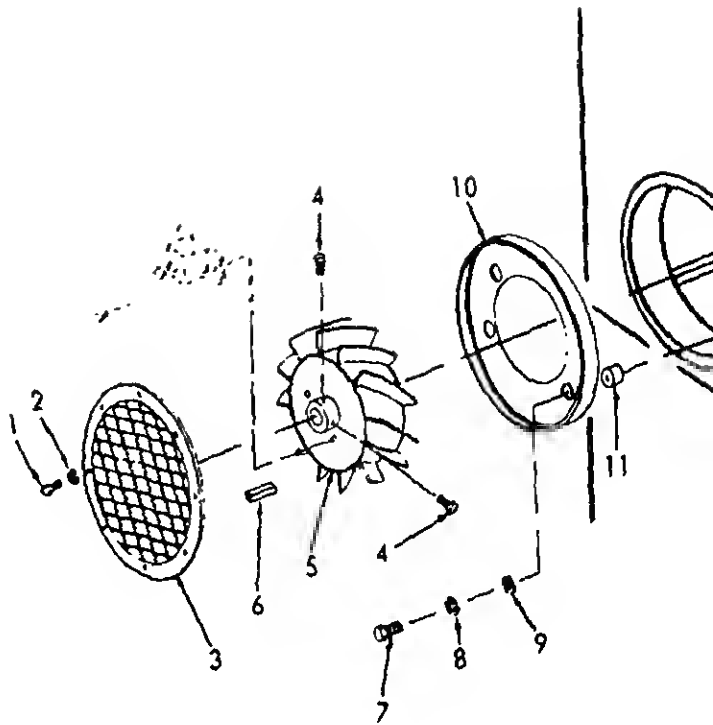
(2) Removal of junction box (para 4-28).

TAG AND DISCONNECT ELECTRICAL LEADS AS NECESSARY.



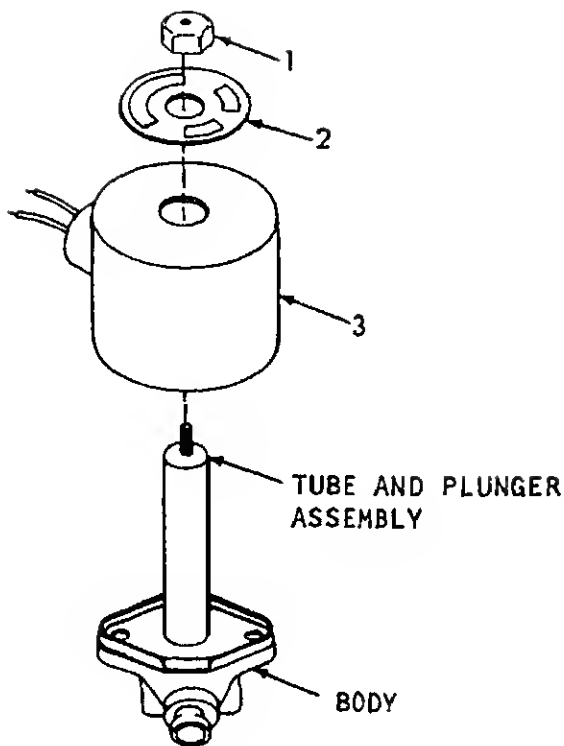
- ) Inspect the solenoid valve visually for physical damage, loose connectors, loose coil and housing and broken or frayed wires or missing insulation.
- ) Test operation by applying 24-28 volts dc to the pins A & B of the electrical connector, and listening for a sharp click which indicates that the solenoid plunger is working properly.
- ) If damage is evident or solenoid plunger fails to operate, replace the coil assembly. If valve still does not operate properly, as indicated by pressure testing or troubleshooting, refer to Direct Support Maintenance for replacement of the diaphragm or the entire valve.





d. Removal.

- (1) Disconnect wiring harness plug from
- (2) Remove screws (1) and lockwashers fan guard (3) to housing.
- (3) Remove condenser fan guard.
- (4) Remove set screws (4).
- (5) Using a wheel puller install two 1 bolts in evenly.
- (6) Remove condenser fan (5) and key (
- (7) Remove screws (7), lockwashers (8) that attach baffle (10) and bushin
- (8) The top nut on the solenoid valve left side.



#### Valve Disassembly

Remove nut (1) and data plate (2) from top of coil assembly (3) and lift off coil assembly.

#### Reassembly of Coil.

If the electrical connector is serviceable, transfer it to a new coil and install the coil assembly on the solenoid valve as follows:

- 1) Place coil assembly (3) over tube and plunger assembly and position data plate (2) on coil assembly. Secure with nut (1).
- 2) Retest plunger operation by applying 24-28 volts dc to pins A and B of receptacle. If no click is heard, refer to Direct Support Maintenance for replacement of the tube and plunger assembly, diaphragm and O-ring, or the valve body.
- 3) If a click is heard when 24-28 volts dc is applied to the solenoid coil, connect the wiring harness electric plug.

# g. Final Installation

- (1) Attach wiring harness plug to solenoid valve
- (2) Install junction box (para 4-28).
- (3) Install lower panel (para 4-12).
- (4) Install baffle (10) and bushings (11) using lockwashers (8) and washers (9).

## CAUTION

Do not hammer the impeller onto the motor shaft. The motor bearings would be damaged. If difficulty is encountered, dress out rough spots on the shaft with a fine file, stone or abrasive cloth. Apply coating of light oil to ease assembly.

- (5) Align key ways in shaft and impeller, install key press impeller (5) onto shaft. The end of the motor shaft even with the face of the hub when the impeller is complete position. Tighten setscrews (4) finger tight. Starting with keyway setscrew, tighten to a final torque of 78-82 pound-inches (8.87 - 9.33 newton-meters).

## NOTE

In order to direct the condenser exhaust upward, away from the intake, the condenser fan guard is designed so that it can be installed in only one way. All screw holes must match to permit proper installation.

- (6) Install condenser fan guard (3) with screws (1) washers (2).

## 4-42.2 PRESSURE EQUALIZER SOLENOID VALVE.

### a. Description.

The pressure equalizer solenoid valve is used to close pressure equalization circuit from the discharge side of the compressor to the suction side. The pressure equalizer solenoid is located in the upper rear part of the air conditioner.

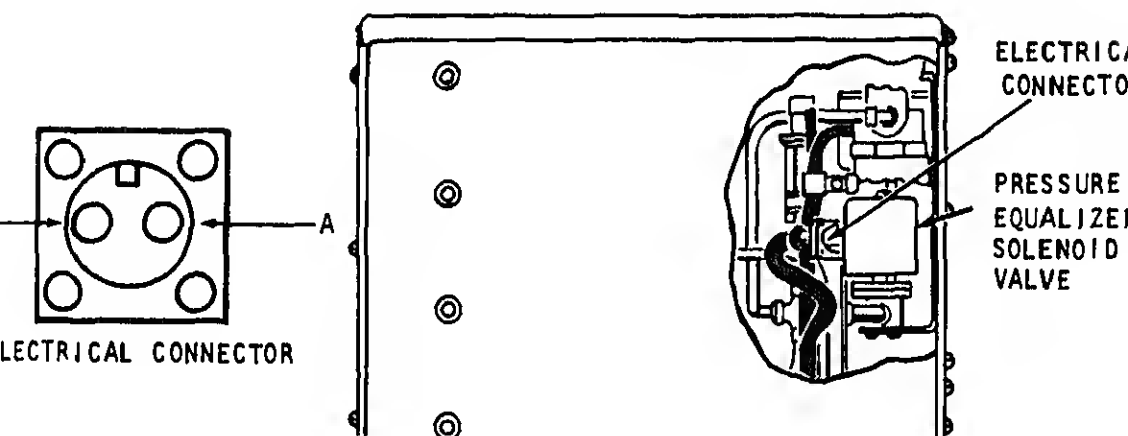
## NOTE

A source of 24 to 28 vdc is required to perform following test.

## Preliminary Requirements.

- (1) Removal of canvas cover (para 4-8).
- (2) Removal of top panel (para 4-9).

NOTE: TAG AND DISCONNECT ELECTRICAL LEADS AS NECESSARY.



## Test.

- (1) Inspect the solenoid valve visually for physical damage, loose connectors, loose coil and housing and broken or frayed wires or missing insulation.
- (2) Test operation by applying 24-28 volts dc to the p & B of the electrical connector, and listening for sharp click which indicates that the solenoid plunger is working properly.
- (3) If damage is evident or solenoid plunger fails to operate, replace the coil assembly. If valve still does not operate properly, as indicated by pressure testing and troubleshooting, refer to Direct Support Maintenance Manual for replacement of the diaphragm or the entire valve.

d. Removal

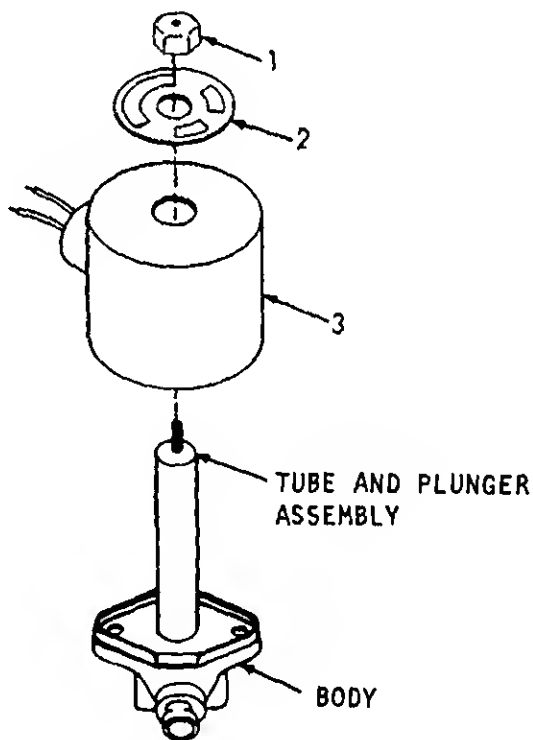
- (1) Disconnect wiring harness plug from receptacle
- (2) Remove screws that attach pressure cut-out switch to frame.

**CAUTION**

Carefully move pressure cut-out switch box to gain access. Capillary tubes may be damaged.

- (3) Move pressure cut-out switch box.
- (4) Access is now available to top nut of solenoid

e. Solenoid Valve Disassembly



Remove nut (1) and data plate (2) from top of coil (3) and lift off coil assembly.

f. Installation of Coil.

If electrical connector is serviceable, transfer it to assembly, and install the coil assembly on the solenoid valve follows:

- (1) Place coil assembly (3) over tube and plunger assembly and position data plate (2) on coil assembly. Secure with nut (1).
- (2) Retest plunger operation by applying 24-28 volts dc pins A and B of receptacle. If no click is heard, refer to Direct Support Maintenance for replacement of the tube and plunger assembly, diaphragm and O-ring, the valve body.
- (3) If a click is heard when 24-28 volts dc is applied to the solenoid coil, connect the wiring harness electrical plug.

## Final Installation

### CAUTION

Carefully move pressure cut-out switch box when reassembling. Capillary tubes may be damaged.

- (1) Relocate pressure cut-out switch box to holes in panel and attach with screws.
- (2) Attach wiring harness plug to solenoid valve.
- (3) Install top panel (para 4-9).
- (4) Install canvas cover (para 4-8).

## SIGHT GLASS.

### Description.

The sight-glass liquid indicator is a circular sealed window on the liquid side of the system between the liquid line solenoid valve and the evaporator coil expansion valve. The indicator is located on the front surface of the air conditioner, below the pressure cutout switch.

### Inspection.

Regularly inspect the sight-glass liquid indicator for physical damage, cracked or broken sight-glass or similar defects.

### Replacement.

Refer to Direct Support Maintenance.

## a. Description.

The condenser coil assembly consists of two coil set of fins: the condenser coil itself, and the subcooler coil (See Refrigeration Diagram, figure 5-1). The condenser is located at the bottom rear section of the air conditioner and is covered by a condenser coil guard and screen assembly to protect it from damage and dirt.

## b. Preliminary Requirements.

(1) Remove canvas cover (para 4-8).

(2) Remove condenser coil guard (para 4-15).

## c. Servicing.

Remove all dust and dirt by using either a vacuum or by brushing.

## d. Replacement.

(1) Replace the condenser coil guard (para 4-15).

(2) Replace canvas cover (para 4-8).

## 4-42.5 EVAPORATOR COIL.

## a. Description.

The evaporation coil receives liquid refrigerant from the expansion valve, and evaporates the liquid to a gas by absorbing heat from the air flow passing over the outside surface of the coil. The evaporator coil is located in the top front section of the air conditioner.

## b. Preliminary Requirements.

(1) Remove canvas cover (para 4-8).

(2) Remove top panel (para 4-9).

(3) Remove air discharge grille (para 4-10).

(4) Remove mist eliminator (para 4-20).

## c. Servicing.

Remove all dust and dirt by using either a vacuum or by brushing.

ement.

- (1) Replace mist eliminator (para 4-20).
- (2) Replace the air discharge grille (para 4-10).
- (3) Replace top panel (para 4-9).
- (4) Replace canvas cover (para 4-8).

ATER.

maintenance of the heater consists of testing and replacement of heater elements and thermostat.

HEATER ELEMENTS.

ription.

Six steel sheathed resistance heating elements are located behind the evaporator coil, and extend all the way across the width of the air conditioner. Three of the elements are energized when the rotary selector switch is set at LO HEAT, and all six are energized when the rotary selector switch is set at HI HEAT. The temperature control thermostat controls only the elements selected by the LO HEAT setting. All six elements are protected against overheating by a thermal overload protector (heater thermostat).

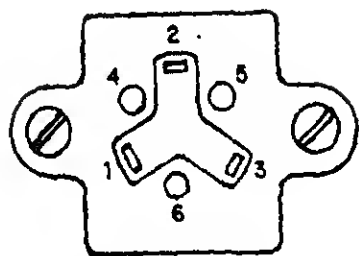
### **WARNING**

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

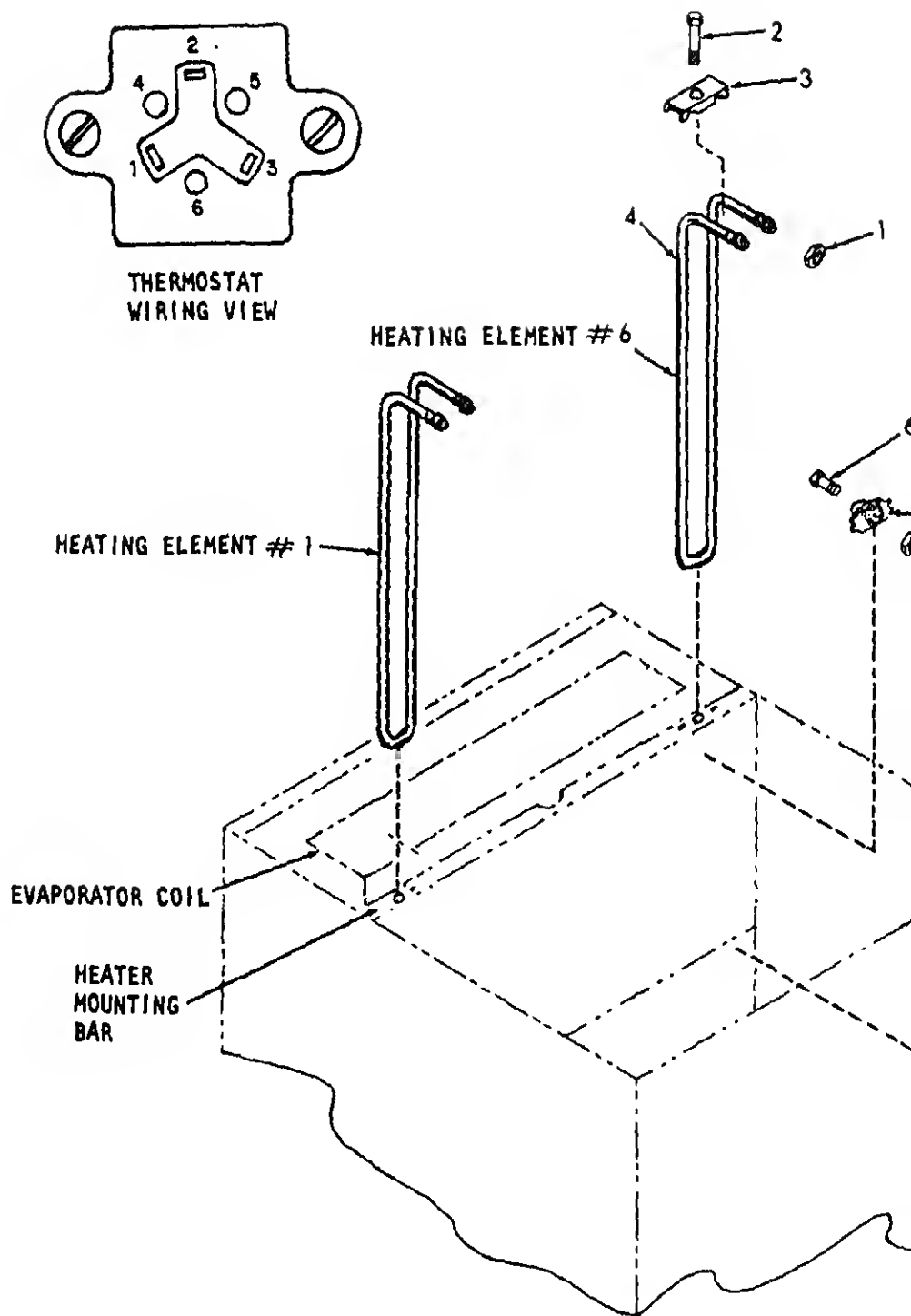
Primary Requirements.

- (1) Remove canvas cover (para 4-8).
- (2) Remove top panel (para 4-9).





THERMOSTAT  
WIRING VIEW



- ) Tag and disconnect wire leads from the ends of each element by unscrewing terminal nuts (1).

#### NOTE

Continuity testing of each element can be performed at this time if further disassembly is not required.

- ) Unscrew the panel fastener screw (2) in each hold-down clamp (3) and remove the clamp. Pull heating element (4) straight up to remove.

ion/Test.

- ) Visually inspect each heating element for damage, deformation, damaged terminal threads, cracked or broken sheath, or burnt-out spots. If damaged, replace.
- ) Using an ohmmeter, multimeter or other continuity tester, check continuity of each heating element. Replace elements that do not indicate continuity.

bly.

- ) Insert each heating element (4) down between the heater mounting bar and the evaporator coil, with each mounting arm equidistant from the panel fastener screw hole.
- ) Place hold-down clamp (3) over both mounting arms, and secure with the panel fastener screw (2).
- ) Make proper wiring connections. (See wiring diagram, figure FU-1).
- ) Replace top panel (para 4-9).
- ) Replace canvas cover (para 4-8).

TER THERMOSTAT.

tion.

ater thermostat is a thermal overload protector, located between the heating elements. It is electrically connected to the heating elements in such a way that if temperature exceeds a preset limit, the heater thermostat opens the circuits. When the temperature has returned to normal, the thermostat automatically closes the circuits to the heating elements.

## WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

### b. Special Tool Required.

Multimeter

### c. Preliminary Requirements.

- (1) Remove canvas cover (para 4-8).
- (2) Remove top panel (para 4-9).

### d. Removal.

#### NOTE

If desired, heating elements 5 and 6 may be removed for better access for removal of the thermostat attaching hardware.

- (1) Tag and disconnect wire leads from the heater (4) to the heater thermostat (5).
- (2) Remove two screws (6) and self-locking nut from the heater thermostat (5). Remove the thermostat.

### e. Inspection/Test

- (1) Visually inspect the heater thermostat for missing housing, missing pieces or other damage.
- (2) Using an ohmmeter or other continuity test, check continuity of the wire leads attached to terminals 5-6, and 4-6 of the heater thermostat. If continuity is not indicated, replace heater thermostat.

### f. Replacement.

- (1) Place the body of the heater thermostat (5) in the mounting hole of the heater assembly support and secure with two screws (6) and self-locking nuts.

#### NOTE

If two heating elements were removed for convenience, replace them at this time.



- (3) Turn the impeller until the impeller cannot be pulled from the screws of sufficient length, into the face of the hub to act as jackscrews. both in equal increments until impeller

- (4) Remove evaporator fan (4) and key (5).

d. Inspection.

- (1) Inspect the inlet ring for nicks, dents, or evidence of rubbing. Replace if damaged.
- (2) Inspect the impeller for gouges, deformation of rubbing, or broken welds. Replace if damaged.

e. Replacement.

**CAUTION**

Do not hammer the impeller onto the motor shaft. The motor bearings would be damaged. In case of difficulty, dress out rough spots on the shaft with a fine file, stone or abrasive cloth. Apply a light coating of light oil to ease assembly.

- (1) Place key (5) in the shaft keyway, and impeller (4) on the shaft. The end of the impeller should be even with the face of the hub.
- (2) Tighten the setscrews (3) over the key tight, then tighten the remaining setscrews. Tighten both setscrews to a final torque of 78.4 - 84.8 (8.87 - 9.33 newton meters).
- (3) Position the inlet ring (2) flat edge to the circular fan opening. Secure with eight screws. Rotate the impeller by hand to be sure the inlet ring exists. Adjust inlet ring if necessary.
- (4) Replace the air filter (para 4-18).
- (5) Replace the air intake grille (para 4-18).

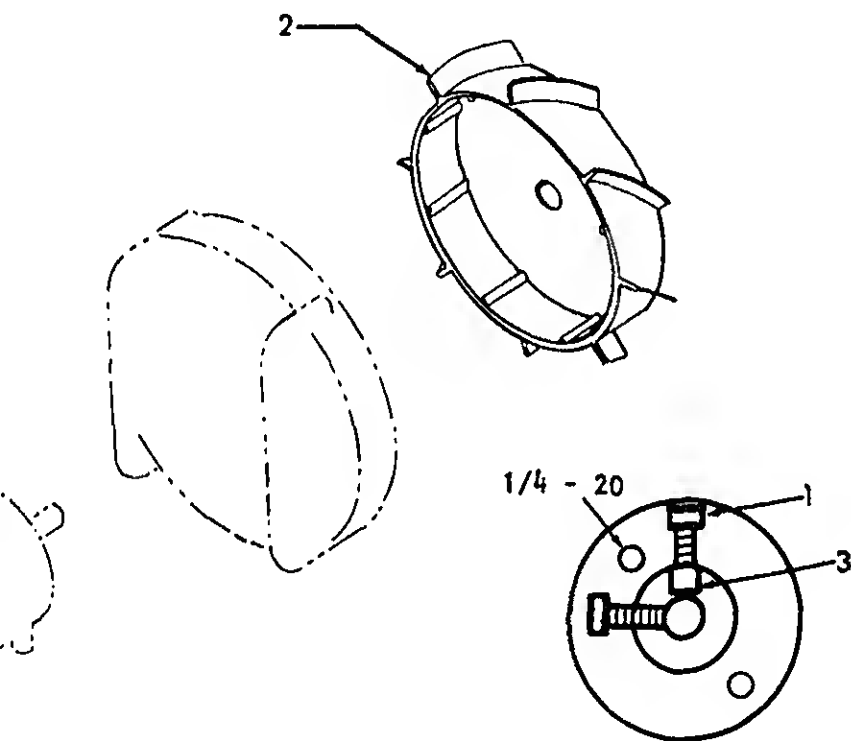
## R FAN ASSEMBLY.

er fan is located behind the circular fan guard on air conditioner. The fan is driven by one end of a wo-speed motor. It consists of an aluminum axial otates within a shroud which is part of the motor drawn into the lower chamber through the conden- exhausted through the fan guard.

### Requirements.

move canvas cover (para 4-8).

move condenser fan guard (para 4-16).



osen two setscrews (1) in the hub of the fan impeller ) and pull the impeller off the motor shaft.

move key (3).

### NOTE

o threaded holes in face of the impeller hub used to attach a wheel puller if necessary.

d. Inspection.

Visually inspect the condenser fan impeller for nick, cracked welds, missing pieces and deformation. Check out of blades for evidence of rubbing or scraping. If there is sufficient to unbalance the impeller, replace it.

e. Replacement.

**CAUTION**

Do not hammer the impeller onto the motor shaft. The motor bearings would be damaged. If difficulty is encountered, dress out rough spots on the shaft with a fine file, stone or abrasive cloth. Apply a coating of light oil to ease assembly.

- (1) Align keyways in shaft and impeller, install and press impeller (2) onto shaft. The end of the shaft should be even with the face of the impeller is completely in position. Tighten (1) finger tight. Starting with the keyway, tighten to a final torque of 78-82 pound-inches (9.33 newton-meters).

**NOTE**

In order to direct the condenser exhaust upward away from the intake, the condenser fan guard is designed so that it can be installed in only one way. All screw holes must match to permit proper installation.

- (2) Replace the condenser fan guard (para 4-16).
- (3) Replace canvas cover (para 4-8).

4-44.3 FAN MOTOR.

a. Description.

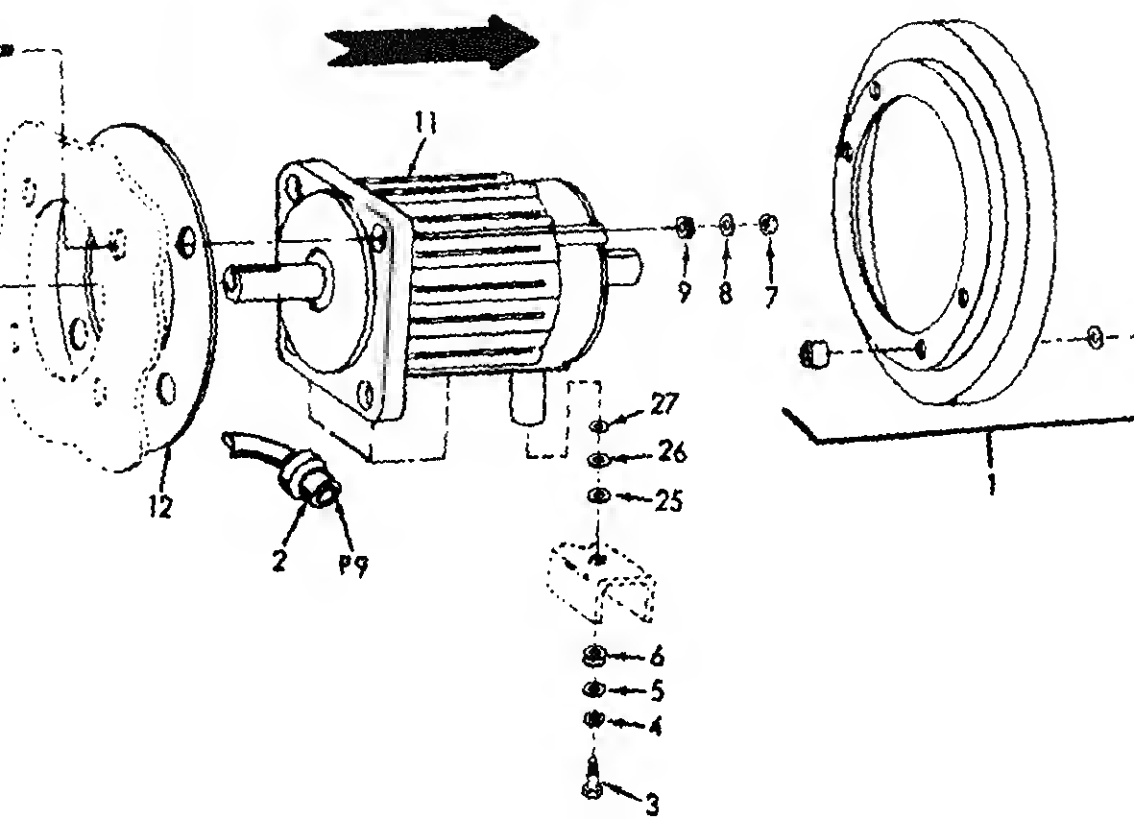
The fan motor is double shafted to drive the evaporator impeller at one end, and the condenser fan impeller at the other. The motor contains two sets of windings, which permits two speed operation. The speed, using one set of windings, is 1725 rpm. When the second set of windings is switched on, the speed increases to 3450 rpm. The motor contains permanently lubricated bearings, and is protected against overheating by a thermal protector.

# WARNING

Disconnect power from the air conditioner before performing maintenance work on the electrical system. The voltage used can be lethal.

## b. Preliminary Requirements.

- (1) Remove canvas cover (para 4-8)
- (2) Remove air intake grille (para 4-11).
- (3) Remove air filter (para 4-18).
- (4) Remove condenser fan guard (para 4-16).
- (5) Remove evaporator fan assembly (para 4-44.1).
- (6) Remove condenser fan assembly (para 4-44.2).





- (1) Unscrew but do not remove four screws baffle (1) to the mounting assembly.
- (2) Disconnect wiring harness plug, P9 (2) receptacle, J9, on the motor junction
- (3) Carefully remove two socket head cap screws (4), flat washers (5), and bushings (6) to secure the motor mounting feet to the
- (4) Remove four self-locking nuts (7), flat washers (8), bushings (9), and flat-head screws (10) of the motor mounting flange (11).
- (5) Carefully withdraw the motor (11) carefully so that the rubber ring (12)

d. Inspection/Test.

- (1) Spin the rotor (13) and listen for bearing noise indicating rough operation. If present, spin slowly backward and forward by hand to seat bearings. Replace bearings if roughness is evident.
- (2) Grip the rotor shaft, and attempt to pull it out to check for end-play. If there is, replace shim(s).
- (3) Using an ohmmeter or other continuity checker, check continuity between connector pin D-F, and between G-H, H-J and G-J. Continuity should be indicated. Also check to be sure that continuity exists between each pin and the motor winding. If continuity requirements are not met, replace motor.

e. Disassembly.

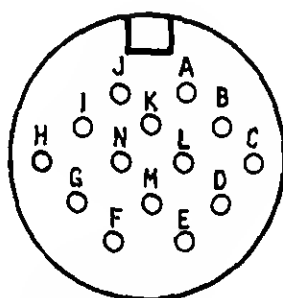
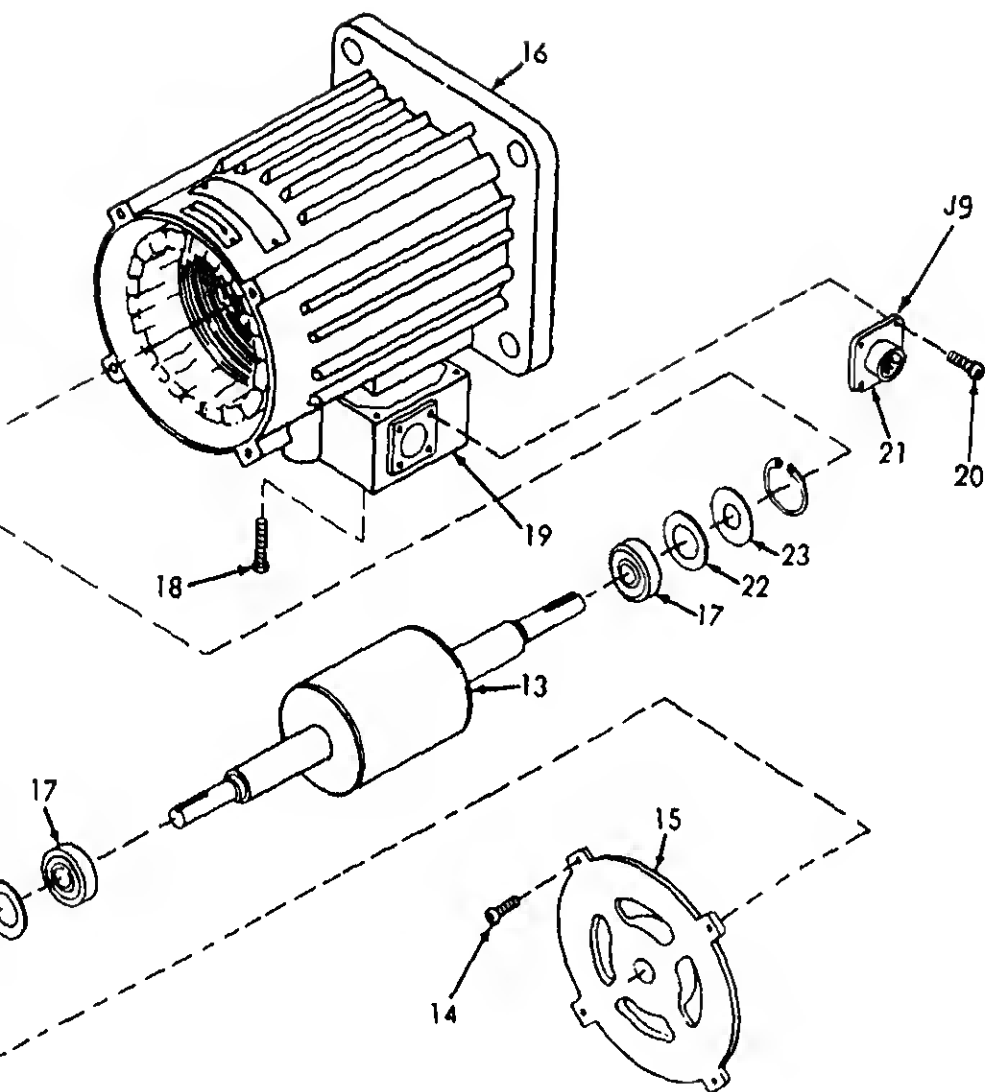
Disassemble the motor only to the extent necessary for repairs.

- (1) Remove four screws (14) and the end plate (15).

**CAUTION**

Keep load spring, shims and washers in the same relationships at disassembly, they will be needed at assembly.

- (2) Withdraw the rotor (13) from the stator and set aside until needed for assembly.



CONNECTOR PIN VIEW J9

- (3) Using an arbor press or equivalent, press windings (17) out of the end plate and the stator careful to avoid cocking.
- (4) Remove four screws (18) from the corners of the box (19) and lift box away from stator.
- (5) Tag wires for identification, and unsolder from connector.
- (6) Remove four screws from corners of connector and remove connector (21) from junction box (19).

f. Cleaning.

**WARNING**

Dry cleaning solvent P-D-680 (item 3, table E-1) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

**CAUTION**

Bearings are permanently lubricated and sealed at the time of manufacture. Do not attempt to clean or relubricate them. Keep bearings in plastic bag or wrap securely in grease-proof paper until needed for assembly.

Blow loose dirt from cavities and windings. Wipe external faces with a cloth moistened with dry cleaning solvent (item E-1).

g. Reassembly (Motor).

- (1) Pull wires through connector hole in junction box and solder them to their respective connector terminals (See wiring diagram, figure FO-1, for proper connections).
- (2) Install receptacle (21) in junction box (19) and secure with four screws (20).
- (3) Position junction box (19) on motor frame (1) and secure with four screws (18) through corners.

- (4) Install a bearing (17), shim (22) and washer (23), in that order, on the shorter shaft of the rotor (13). Insert the rotor into the stator (16), and guide the bearing into the bearing recess in the stator.
- (5) Place a bearing (17), shim (22) and load spring (24), that order, over the longer shaft of the rotor (13). Carefully fit end-plate (15) over the assembly, guiding the bearing into the bearing recess.
- (6) Secure the end plate (15) to the stator (16) with four screws (14), tightened uniformly in increments. Attempt to turn shaft by hand. If shaft does not turn freely, check assembly of end plate on stator, and adjust if necessary.

lation.

- (1) Position the flange end of the motor (11) against the partition. Install four flat-head screws (10) through the inlet fan ring (12) and the partition and the hole in the corners for the motor's mounting flange. Place a bushing (9), a washer (8) and a self-locking nut (7) on each screw, and tighten finger-tight.

#### NOTE

Trial-fit resilient washers of the same thickness at first, then replace with different sizes if necessary to center impellers.

- (2) Place a lock washer (4), flat washer (5), and bushing (6) (flange end toward bolt head) on a socket-head shoulder bolt (3) and partially insert bolt into hole in cross-bar. On top of cross-bar, place a resilient washer (25), large flat washer (26), and small flat washer (27) between the cross-bar and the motor mounting foot. Push bolt and bushing up through the resilient washer, and screw bolt into the motor mounting foot. Repeat assembly in the same order for the other mounting foot. Tighten both bolts uniformly, and check for concentricity of impellers and openings.

Adjust by replacing resilient washers with those of a different thickness, as required. When satisfactory, tighten all mounting bolts, including the four bolts and nuts in the corners of the flange.

- (3) Connect wiring harness plug, P9, to the receptacle on the motor's junction box. Temporarily connect power to the air conditioner, and turn mode selector switch to VENTILATE. Check operation and direction of rotation of motor at LO SPEED, and HI SPEED settings.

of baffle (1). Place a spacer over each convex surface, and tape in place with m. Carefully position the convex side of the mounting bracket, and secure by tight screws.

- (5) Replace condenser fan assembly (para 4-4).
- (6) Replace condenser fan guard (para 4-16).
- (7) Replace evaporator fan assembly (4-44.1)
- (8) Replace air filter (para 4-18).
- (9) Replace air intake grille (para 4-11).
- (10) Replace Canvas cover (para 4-8).

#### 4-45. WIRE LEADS AND WIRING HARNESS.

Preferred repair methods consist of replacing wire connectors, etc. rather than splicing wires, bending terminals, and other make-shift procedures, although the latter are appropriate for emergency field repairs. Determine the type and length of wire, terminal or connector to be used by referring to Table 4-3, Wire List, and to the wiring diagram (figure F0-1).

a. Soldering Connections. Wire connections must be mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces to be soldered must be clean and bright. If a solder is used, it should conform to Specification MIL-F-4995, Type 60, and alcohol flux, and should be brushed onto the joint before soldering. If a flux-core solder is used, it should always be rosin-core solder. If an uncured solder is used, it should be preheated (item 12, table E-1). Wires should always be heated to the point at which the solder will melt completely and flow into the joint. Excessive build-up of solder "gobs" on the wires should be avoided or removed.

b. Insulating Joints. The preferred method of insulating electrical joints is by the use of heat-shrink tubing. To insulate a joint, use a piece of heat-shrink tubing of suitable diameter to a size that will allow for covering joints at terminals or connectors, or to a size that is 1.2-inch longer than the joint to be insulated, and slip the tubing over the wire before making the joint. After the joint is made, slide the tubing over the joint, and shrink in place with moisture or heat.

sound, the mating ends can be stripped and spliced. A common splice can be crimped onto the ends to join them, or a "Weinman" wire splice can be made. The latter is made by stripping 1/4 inch of insulation from the wire ends, slide a piece of heat-shrink tubing over wire, then holding the ends parallel and facing opposite directions, twisting each end around the other wire at least three turns. Solder and apply heat-shrink tubing and heat-shrink tubing as described above.

4. Crimping Terminals. To install a terminal on the end of a wire, strip 1/4 to 1/2 inch of insulation from the end of the wire, apply a 1/2 inch piece of heat-shrink tubing (if the terminals are of the insulated type), and insert wire-end into the shank of the terminal. Solder the shank, and install heat-shrink tubing if necessary.

Table 4-3. Wire List

Wire D. No.	FROM		TO		Length (Inches)	Wire Size
Terminal Type	Term. No.	Terminal Type	Term. No.			
Wiring Harness -- Control Module						
8A16N	MS3102R28-11P	J7-A	MS25036-108	E2	3	
E14B	MS3102R28-11P	J7-M	Both in	S1-41	8	
F16B	13211E8288	S1-31	13211E8288	S1-41	2.82	
E16	13211E8288	J7-X	Both in	S1-11	10	
F18	13211E8288	S1-11	MS25036-153	S2-1	8.5	
A18	MS3102R28-11P	J7-W	13211E8288	S1-10	10	
E14C	MS3102R28-11P	J7-K	13211E8288	S1-4	9	
0A16	MS3102R28-11P	J7-N	13211E8288	S1-1A	11	
E14A	MS3102R28-11P	J7-J	Both in	S1-22	10.37	
F16A	13211E8288	S1-32	13211E8288	S1-22	1.75	
A16	MS3102R28-11P	J7-T	13211E8288	S1-1B	11	
A16A	MS3102R28-11P	J7-I	13211E8288	S1-2B	10.37	
A16A	MS3102R28-11P	J7-C	13211E8288	S1-2C	9.37	
A16A	MS3102R28-11P	J7-V	13211E8288	S1-3A	9.82	
0A16B	MS3102R28-11P	J7-U	13211E8288	S1-3C	8.62	
8A18C	MS3102R28-11P	J7-E	13211E8288	S1-4A	9	
A16B	MS3102R28-11P	J7-D	13211E8288	S1-4C	8	
F16	MS3102R28-11P	J7-B	MS25038-106	S8-2	4	
3C16B	MS3102R28-11P	J7-H	13211E8288	S1-21	9.47	
A16	13211E8288	S1-12	MS25036-153	S2-2	4.5	
G16	MS25038-153	S2-1	MS25038-106	S8-1	5	

Table 4-3. Wire List - Continued

Wire I.D. No.	FROM		TO	
	Terminal Type	Term. No.	Terminal Type	Term. No.
<b>Electrical Lead Pressure Cutout Switches</b>				
V7A16	MS25035-153	S6-1	MS25035-153	S7-2
<b>Wiring Harness — Power Input to RFI Filter</b>				
X2A10A	MS3100R22-22P	J1-A	MS3105R22-22S	P10-
X3A10B	MS3100R22-22P	J1-B	MS3105R22-22S	P10-
X4A10C	MS3100R22-22P	J1-C	MS3105R22-22S	P10-
X5A10N	MS3100R22-22P	J1-D	MS3105R22-22S	P10-
<b>Wiring Harness — Junction Box Power Input</b>				
X2B10A	MS3102R22-22P	J2-A	MS25035-112	TB1-
X3B10B	MS3102R22-22P	J2-B	MS25036-112	TB1-
X4B10C	MS3102R22-22P	J2-C	MS26035-112	TB1-
X5B10N	MS3102R22-22P	J2-D	MS25035-112	E1
<b>Wiring Harness — Power Input from RFI Filter</b>				
X2L10A	MS3106R22-22P	P11-A	MS3106R22-22S	P2-A
X3L10B	MS3106R22-22P	P11-B	MS3106R22-22S	P2-B
X4L10C	MS3106R22-22P	P11-C	MS3106R22-22S	P2-C
X5C10N	MS3105R22-22P	P11-D	MS3106R22-22S	P2-D
<b>Wiring Harness — Heater</b>				
X15C16A	MS3100R14S-5P	J6-A	MS25036-108	HR1-A
X19C15B	MS3100R14S-6P	J6-B	MS25035-108	HR2-A
X17C16C	MS3100R14S-5P	J6-C	MS25035-108	HR3-A
X8C16C	MS3100R14S-6P	J6-D	MS25035-108	HR4-A
X7C15B	MS3100R14S-5P	J8-E	MS25036-108	HR5-A
X9C16A	MS3100R14S-6P	J6-F	MS25035-108	HR5-A
X24B16A	MS25036-108	HR1-B	MS25035-108	HR6-E
X21B16B	MS25036-108	HR2-B	MS25036-108	HR5-E
X22B16C	MS25036-108	HR3-B	MS25035-108	HR4-F
<b>Wiring Harness — Junction Box</b>				
X43A16A	MS3102R36-7S	J3-P	MS25035-153	K5-A2
X44A15B	MS3102R36-7S	J3-P	MS25036-153	K5-B2
X26A16A	MS3102R36-7S	J3-S	MS25036-153	K5-C2
X23A15B	MS3102R36-7S	J3-h	MS25035-153	K5-D2
X25A16A	MS3102R36-7S	J3-U	MS25036-153	K5-C1
Z20A16B	MS3102R36-7S	J3-R	MS25036-153	K5-D1
V4D16	MS3102R36-7S	J3-Z	MS25035-153	K5-X2
X39A16A	MS25036-163	K5-A1	MS25035-153	K4-A1
V4C16	MS26036-163	K5-X2	MS25036-153	K4-X2
X41A16B	MS26036-163	K5-B1	MS25035-153	K4-B1
X40A16B	MS25036-153	K5-D3	MS25036-153	K4-B3
X36A16A	MS25036-153	K5-C3	MS25036-153	K4-A3

Table 4-3. Wire List - Continued

FROM		TO		Length (Inches)	Wire Size
Terminal Type	Term. No	Terminal Type	Term. No		
Wiring Harness — Junction Box (Con't)					
MS3102R36-7S	J3-c	MS25036-153	K4-A2	10.63	18
MS3102R36-7S	J3-a	MS25036-153	K4-B2	10.00	16
MS3102R36-7S	J3-X	MS26036-153	K4-C2	9.37	16
MS3102R36-7S	J3-W	MS25036-153	K4-D2	8.75	16
MS3102R36-7S	J3-V	MS25036-153	K4-D1	8.75	16
MS3102R36-7S	J3-O	MS25036-153	K4-X2	9.00	16
MS25036-153	K4-X1	MS25036-153	K5-X1	9.00	16
MS3102R36-7S	J3-f	MS25036-153	XF2-2	14.75	16
MS3102R36-7S	J3-g	MS25036-153	XF2-2	14.75	16
MS3102R36-7S	J3-C	MS25036-106	TB2-1	7.25	16
MS3102R36-7S	J3-E	MS25036-106	TB2-2	7.62	16
MS3102R36-7S	J3-G	MS25036-106	TB2-3	8.00	16
MS3102R36-7S	J3-H	MS25036-106	TB2-4	6.36	16
MS3102R36-7S	J3-1	MS25036-106	TB2-5	6.75	16
MS3106R36-7S	J3-J	MS25036-106	TB2-5	8.75	16
MS3106R36-7S	J3-K	MS25036-106	TB2-6	9.12	16
MS25036-153	K6-X1	MS26036-106	TB2-6	9.12	16
MS3102R36-7S	CB1-B1	MS25036-112	K1-B2	12.95	12
MS3102R36-7S	J3-v	13216E6191-3	CB1-A2	20.62	12
MS3102R36-7S	J3-w	13216E6191-3	CB1-C2	20.62	12
MS3102R36-7S	J3-D	MS25036-106	TB2-1	7.50	16
MS3102R36-7S	J3-F	MS25036-153	K1-X1	17.37	18
MS3102R36-7S	J3-L	MS25036-108	K2-A1	16.63	16
MS3102R36-7S	J3-M	MS25036-106	K2-B1	16.95	16
MS3102R36-7S	J3-N	MS25036-106	K2-C1	15.50	16
MS3102R36-7S	J3-t	MS25036-112	E1	4.75	12
MS3102R36-7S	J3-Y	MS25036-106	E1	4.75	16
MS3102R36-7S	J3-p	MS25036-106	XF1-4	16.25	16
MS3102R36-7S	J3-d	MS25036-106	TB2-4	10.66	16
MS3102R36-7S	J3-e	MS25036-153	K2-X2	17.37	16
MS3102R36-7S	J3-b	13216E6192	CB1-NO	20.82	16
MS3102R36-7S	J3-x	MS25036-108	TB1-1	12.37	14
MS3102R36-7S	J3-y	MS25036-106	TB1-3	13.50	14
MS3102R36-7S	J3-z	MS25036-106	TB1-2	12.25	14
MS25036-153	K2-X1	MS25036-106	TB2-6	11.49	16
13216E6191-2	CR1-2	MS25036-106	TB2-6	15.82	16
MS25036-112	TB1-2	MS25036-112	K1-B1	13.45	12
MS25036-112	TB1-1	MS25036-112	K1-A1	13.75	12
MS25036-112	TB1-3	MS25036-112	K1-C1	13.75	12
13218E6192	CB1-C	MS25036-153	K1-B1	4.30	16
13216E6191-3	CB1-A1	MS25036-112	K1-A2	10.88	12
13216E6191-3	CB1-C1	MS25036-112	K1-C2	9.76	12
MS25036-153	K1-X2	MS25036-106	TB2-2	16.24	16



Table 4-3. Wire List - Continued

Wire I.D. No.	FROM		TO	
	Terminal Type	Term. No.	Terminal Type	Term. No.
<b>Wiring Harness — Junction Box (Con't)</b>				
V13E16N	MS25036-153	K1-X1	MS26036-163	K2-X1
X2H12A	MS25036-112	K1-X1	MS26036-112	K2-A2
X3J12B	MS25036-112	K1-B1	MS25036-112	K2-B2
X4G12C	MS26036-112	K1-C1	MS26036-112	K2-C2
X4H16C	MS26036-153	K4-D3	MS26036-106	K2-C2
X4K16C	MS25036-153	K4-D3	MS25036-153	K4-C1
X2J16A	MS25036-106	XF1-1	MS26036-106	K2-A2
X13D16N	MS3102R-36-7S	K3-6	MS25036-153	K1-X1
V14B16	MS3102R-36-7S	K3-2	MS25036-106	TB2-3
V14A16	MS3102R-36-7S	K3-2	MS3102R36-7S	K3-1
V12B16	MS3102R-36-7S	K3-3	MS25036-106	TB2-2
V2A16	13216E6191-2	CR1-3	MS25036-106	XF2-1
X35A16A	13216E6191-2	CR1-1	MS25036-106	T1-X2
X34A163	13216E6191-2	CR1-4	MS25036-106	T1-X1
X33A16A	MS25036-106	T1-H2	MS25036-106	XF1-2
X31A16B	MS25036-106	T1-H1	MS25036-106	XF1-3
X20A12B	MS26036-112	CB1-B2	MS3102R36-7S	J3-4
V8F16N	MS25036-106	TB2-6	MS26036-108	E1
X3L16B	MS3102R36-7S	J3-A	MS25036-108	TB1-2
X4L16C	MS3102R36-7S	J3-B	MS25036-108	TB1-3
<b>Wiring Harness — System Interconnecting</b>				
V3B16*	MS3106R36-7P	P3-g		S3-1
V4A16*	MS3106R36-7P	P3-O		S3-2
X27B16C	MS3106R36-7P	P3-V	MS3106R20-27S	P9-C
X4D14C	MS3106R36-7P	P3-y	MS3106R26-11S	P7-K
V6E16	MS3106R36-7P	P3-C	MS26036-163	S7-1
X13B16B	MS3106R36-7P	P3-b	MS3106R36-7P	P7-H
X29B16C	MS3106R36-7P	P3-W	MS3106R20-27S	P9-F
V6B16	MS3106R36-7P	P3-D	MS3106R26-11S	P7-W
X6B16A	MS3106R36-7P	P3-c	MS3106R26-11S	P7-1
X19B16B	MS3106R36-7P	P3-M	MS3106R146-6S	P6-B
X20B16B	MS3106R36-7P	P3-R	MS3106R20-27S	P9-A
X26B16A	MS3106R36-7P	P3-U	MS3106R20-27A	P9-B
X16B16A	MS3106R36-7P	P3-L	MS3106R14S-6S	P6-A
V4E16	MS3106R36-7P	P3-Z	MS3106R26-11S	P7-B
V10B16	MS3106R36-7P	P3-e	MS3106R26-11S	P7-N
X32B12C	MS3106R36-7P	P3-w	MS3106R20-16S <sup>9</sup>	P4-C
X26B12B	MS3106R36-7P	P3-u	MS3106R20-15S	P4-B
V11E16	MS3106R36-7P	P3-H	MS3106R12S-3S	P6-B
V13B16N	MS3106R36-7P	P3-F	MS3106R12S-3S	P6-B
V12D16	MS3106R36-7P	P3-E	MS3106R12S-3S	P6-A

Table 4-3. Wire List - Continued

FROM		TO		Length (Inches)	Wire Size
Terminal Type	Term. No.	Terminal Type	Term. No.		
<b>Wiring Harness — System Interconnecting (Con't)</b>					
MS3106R36-7P	P3-t	MS25036-157	E3	17.00	12
MS3106R36-7P	P3-G	MS3106R20-16S	P4-D	31.00	16
MS3106R36-7P	P3-K	MS3106R12S-3S	P5-A	35.00	16
MS3106R36-7P	P3-J	MS3106R20-15S	P4-E	31.00	16
MS3106R36-7P	P3-v	MS3106R20-16S	P4-A	31.00	12
MS3106R36-7P	P3-N	MS3106R14S-6S	P8-C	60.00	16
MS3106R36-7P	P3-d	MS3106R26-11S	P7-T	19.00	16
MS3106R36-7P	P3-Y	MS3106R28-11S	P7-A	19.00	16
MS3106R36-7P	P3-f	MS3106R28-11S	P7-X	19.00	16
MS3106R36-7P	P3-x	MS3106R28-11S	P7-J	19.00	14
MS3106R36-7P	P3-z	MS3106R28-11S	P7-M	19.00	14
MS3106R36-7P	P3-a	MS3106R28-11S	P7-U	19.00	16
MS3106R36-7P	P3-l	MS25036-153	S6-2	66.00	16
MS3106R36-7P	P3-S	MS3106R20-27S	P9-E	40.00	16
MS3106R36-7P	P3-h	MS3106R20-27S	P9-D	40.00	16
MS3106R36-7P	P3-p	MS3106R28-11S	P7-C	19.00	16
MS3106R14S-6S	P8-D	MS3106R28-11S	P7-E	69.00	16
MS3106R14S-6S	P8-E	MS3106R28-11S	P7-D	69.00	16
MS3106R14S-6S	P8-F	MS3106R28-11S	P7-V	69.00	16
MS3106R36-7P	P3-P	MS3106R20-27S	P9-G	40.00	16
MS3106R36-7P	P3-T	MS3106R20-27S	P9-H	40.00	16
MS3106R36-7P	P3-X	MS3106R20-27S	P9-J	40.00	16
MS3106R36-7P	P3-A	MS3106R20-16S	P4-G	31.00	16
MS3106R36-7P	P3-B	MS3106R20-16S	P4-F	31.00	16

Pressure switch assembly.....

#### 4-46. PREPARATION FOR STORAGE.

The air conditioner is prepared for storage or moving by performing the following:

- (1) Turn off electrical power supply to air conditioner and disconnect power cable from unit.
- (2) Disconnect drain hose from unit (if used).

#### NOTE

Disconnect duct work, CBR filter and remote control if used.

- (3) Unbolt unit from mounting surface.
- (4) Close the canvas cover.

#### 4-47. SHIPMENT.

The air conditioner should be moved as follows:

- (1) Short Distance Movement. Lift unit at corners and lift or carry unit to new worksite using four corners of unit. Keep unit vertical.
- (2) Long Distance Movement. Crate the air conditioner providing adequate protection for grill and control panel. Refer to TM 38-250 for crate fabrication. Provide suitable blocking and tiedowns to prevent shifting during transfer. Keep unit vertical.

For administrative storage of equipment refer to TM 38-250 instructions.

# DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

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## Section I. GENERAL

RAL.

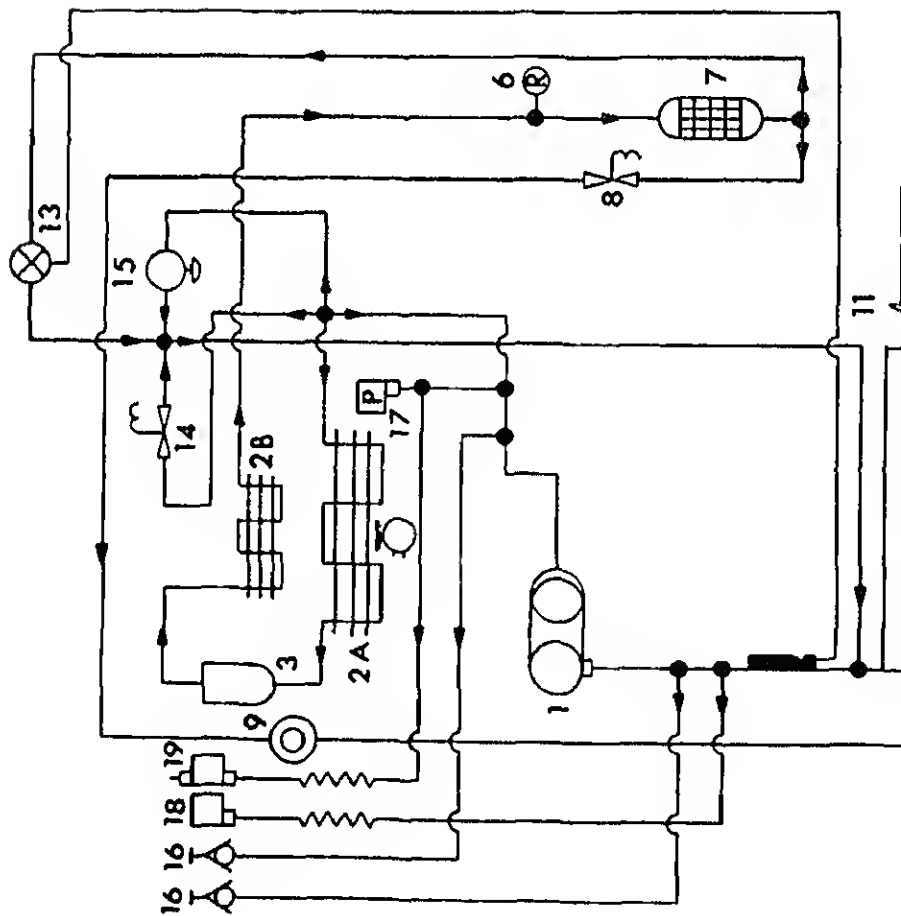
chapter is for the use of direct support maintenance

This chapter contains a section on troubleshooting and the procedures for discharge, leak testing, evacuation, pressure testing of the air conditioner after the replacement components that require system discharge. Figure 5-1 is a flow diagram that is included to assist maintenance of the components.

## Section II. TROUBLESHOOTING

RAL.

This section contains troubleshooting information (table 5-1) for Direct Support Maintenance personnel. The malfunctions pertain to refrigerant components only. The organizational maintenance routing table in Chapter 4 should be reviewed prior to any work on refrigerant components.



- 1.
- 2A.
- 2B.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.

Compressor (3 Phase, 50/60 Hz, 208 V)  
 Condenser Coil  
 Subcooler Coil  
 Receiver  
 (Not Used)  
 (Not Used)  
 Pressure Relief Valve  
 Filter-drier (Dehydrator)  
 Solenoid Valve (Evaporator)  
 Sight-glass Liquid Indicator  
 Expansion Valve (Evaporator)  
 Distributor  
 Evaporator Coil  
 Expansion Valve (Liquid Quench)  
 Solenoid Valve (Bypass)  
 Pressure Regulating Valve  
 Service Valve  
 Pressure Switch (two-speed fan)  
 Low-pressure Cutoff Switch  
 High-pressure Cutoff Switch

## INSPECTION CORRECTIVE ACTION

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### INLET COOLING

Check sight glass liquid indicator for bubbles. If bubbles exist check system for leaks.

Repair leaks, and recharge system (para 5-5 through 5-8).

Feel filter-drier (dehydrator) to see whether it is cold to the touch, or is frosted or sweating. Cold discharge indicates obstruction.

Discharge system slowly over a period of about one hour to prevent oil being blown out of system, then replace filter-drier (para 5-15).

Check inlet and discharge sides of solenoid valves for temperature difference. Abnormally cold discharge indicates leakage or obstruction.

Repair or replace faulty solenoid valve (para 5-14).

Check evaporator coil for over-all temperature. If part of coil is relatively warm, and evaporator refrigerant inlet is sweaty or frosty, expansion valve may be damaged or obstructed.

Replace faulty expansion valve (para 5-22).

### UNUSUALLY NOISY OPERATION

**CAUTION**

If knocking or hammering is heard when air conditioner is started up, shut down at once. The compressor may be pumping liquid refrigerant, which will cause severe damage.

Listen for knocking or hammering sounds. Install gauge set and check for high discharge pressure (para 5-8).

Recharge off some refrigerant (para 5-3).

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

3- COMPRESSOR WILL NOT START

Step 1. Check condition of high- and low-pressure switches by pressing reset buttons. Check pressure cutout switches (para 5-11).

Step 2. Disconnect plug, P4, from compressor and connect an ohmmeter or continuity tester, testing between points A-B, A-C, B-C, and D-E. Continuity should be indicated. Test points A, B and C to common ground. No continuity should be indicated.

Replace compressor that does not meet requirements (para 5-9).

4- COMPRESSOR STARTS BUT STOPS AT ONCE -- "SHORT CYCLE"

Step 1. Check sight-glass liquid indicator while compressor is operating. If bubbles are present, check refrigeration system for leaks (para 5-11).

Repair leaks, and add refrigerant until system pressure is normal when compressor is running.

Step 2. Connect pressure gauges to suction and discharge service valves. Check system pressure and compare with indicated in the following Table:

NORMAL TEMPERATURE -- PRESSURE RELATIONSHIPS

95°F (36°C) dry bulb return air to unit				
Outdoor ambient temperature	50°F 10°C	75°F 24°C	100°F 38°C	
<i>Gauge Pressures</i>				
Suction (psig) (Kg/Cm <sup>2</sup> )	56-60 3.93-4.22	56-65 3.93-4.57	65-75 4.57-5.27	4
Discharge (psig) (Kg/Cm <sup>2</sup> )	135-155 9.50-10.90	185-205 13.00-14.41	275-295 19.33-20.74	26

ON  
OR INSPECTION  
CORRECTIVE ACTION

80°F (27°C) dry bulb return air to unit

	50°F 10°C	75°F 24°C	100°F 38°C	125°F 52°C	
ient re					
ures					
sig)	56 min.	56 min.	56-65	65-75	
2)	3.93 "	3.93 "	3.93-4.57	4.57-5.27	
sig)	130-150	180-200	270-290	290-410	
2)	9.14-10.55	12.65-14.06	18.98-20.39	20.39-28.82	

bulb temperatures are measured with an ordinary thermometer

If pressures are too low, check for leaks and add refrigerant; if too high, bleed off refrigerant until pressure is normal.

3. If pressures are normal, turn off power, and short-circuit high- or low-pressure cutout switch. Turn on power for maximum of 12 seconds, and see whether compressor operates normally.

**CAUTION**

Do not exceed 12-second operating time, or vacuum may be formed in suction side of refrigeration system and damage compressor.

Bleed off refrigerant slowly, over a period of about one hour, to prevent oil being blown out of system, then replace faulty pressure cutout switch and recharge system.

SSOR RUNS BUT DOES NOT COOL

1. Check sight-glass liquid indicator for bubbles indicating low charge of refrigerant. If bubbles are present, check refrigeration system for leaks (para 5-5) .

Discharge system slowly, over a period of about one hour, to prevent oil being blown out of system, then repair leaks or replace leaking component.



## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

- Step 2. Remove evaporator air discharge grill. If evaporator coil icing. If icing is gas bypass pressure regulating valve pressure).

**CAUTION**

Do not use steam, open flame, heat gun, high-temperature heat source to thaw evaporator coil.

Thaw an iced coil with a lamp bulb (75-watt), dryer or electric fan, and adjust pressure.

- Step 3. Check compressor motor for noisy operation, pressure, or excessively low discharge pressure. If internal valves.

Bleed off refrigerant slowly, over a period of 1 hour, to prevent oil being blown out of faulty compressor and recharge system.

## 6- SUCTION PRESSURE TOO LOW OR TOO HIGH

- Step 1. Stop compressor and check thermostat as follows:
- Remove insulating compound from remote bulb from refrigerant line. (Note pressure removal and be sure it is replaced.)
  - Place bulb in ice water for 1-2 minutes.
  - Remove bulb from ice water and hold warm it. At the same time, start the compressor. If the suction line for a rapid change indicates flood-through of liquid refrigerant, it is operating. If not, valve or remote bulb is faulty.

TION  
ST OR INSPECTION  
CORRECTIVE ACTION

CAUTION

Do not let liquid flood back into compressor for more than 2-3 seconds or the compressor will be seriously damaged.

Discharge refrigerant from system slowly, over a period of about one hour, to prevent blowing oil out of system. Replace faulty expansion valve and filter-drier (para 5-2 and 5-15). Purge with dry nitrogen and recharge (para 5-7).

- ep 2. Feel filter-drier for temperature difference. Discharge end will feel cooler than input end if clogged, or discharge end may be sweaty or frosty.

Discharge refrigeration system slowly, over a period of about one hour to prevent blowing oil out of system. Replace filter-drier, purge with dry nitrogen, and recharge.

### Section III. MAINTENANCE PROCEDURES

#### SYSTEM DISCHARGE.

Before removing any refrigeration component from the air conditioner, all refrigerant gas must be discharged from the system. (See figure 5-2.) Proceed as follows:

- 1 - Remove five screws from the frame of the fresh air screen in the upper right-hand corner of the rear surface of the air conditioner. Remove the fresh air screen to obtain access to the suction and discharge service valves.
- 2 - Remove the chained cap from the suction service valve and connect a hose of sufficient length to reach a safe location, preferably outdoors, for discharge of refrigerant gas.

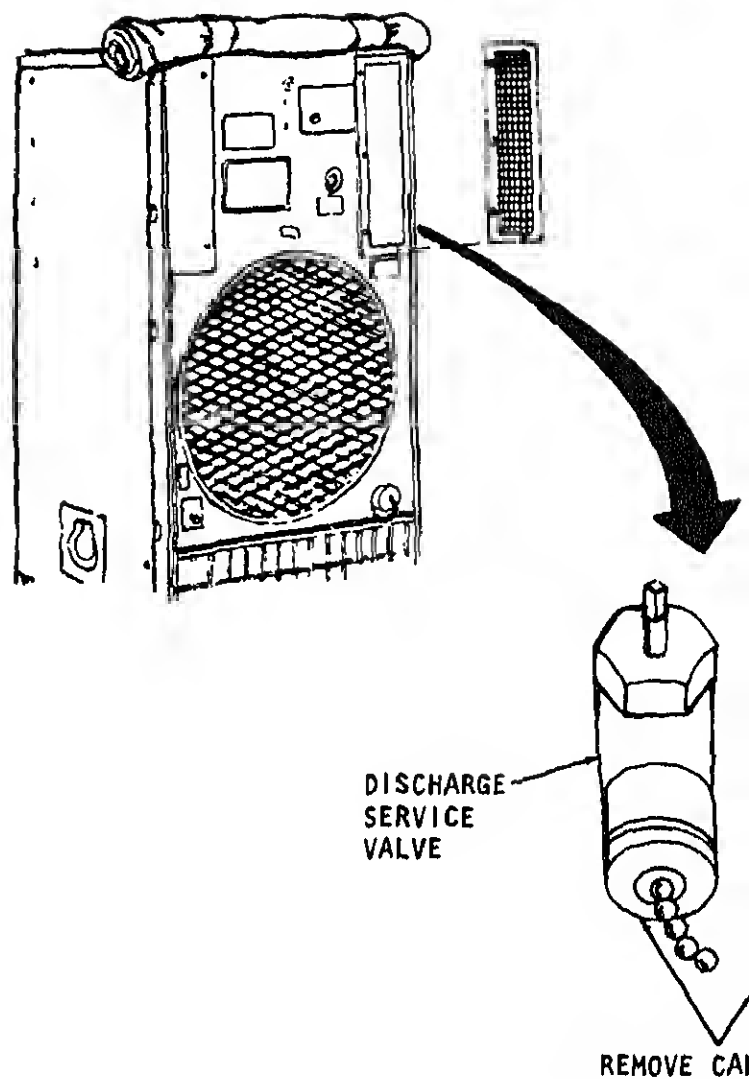


Figure 5-2. System Discharge

# **WARNING**

Use great care to avoid contact with refrigerant or refrigerant gas being discharged from a container under pressure. Sudden and severe tissue damage can result from freezing of unprotected skin. Wear proper personal protective equipment (PPE), including safety glasses, gloves, and a face shield. Prevent contact of refrigerant gas with metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride, a highly toxic and corrosive gas.

- 3 - Crack open the suction service valve to allow refrigerant gas to be discharged slowly, over a period of 10 minutes. A rapid discharge will cause oil to be discharged from the system.

Connect a cylinder of dry nitrogen (item 8, table E-1) to the gauge port of the discharge service valve. Open the cylinder shutoff valve and the discharge service valve slightly, and completely open the suction service valve to purge the system of refrigerant gas. Use 1-2 fpm (0.1-0.2 M<sup>3</sup>/minute).

#### NOTE

Nitrogen is always used to purge the refrigeration system during brazing or debrazing of connections, to prevent internal oxidation and scaling.

Nitrogen (item 8, table E-1) flowing through the system during connections can be debrazed. Refer to paragraph 5-13(4) of tubing repair, disconnection, and replacement.

#### WARNING

Polyurethane Foam insulation breaks down to form toxic gases when heated to brazing temperatures. Refer to paragraph 5-13(4), Protection from Heat.

NG.

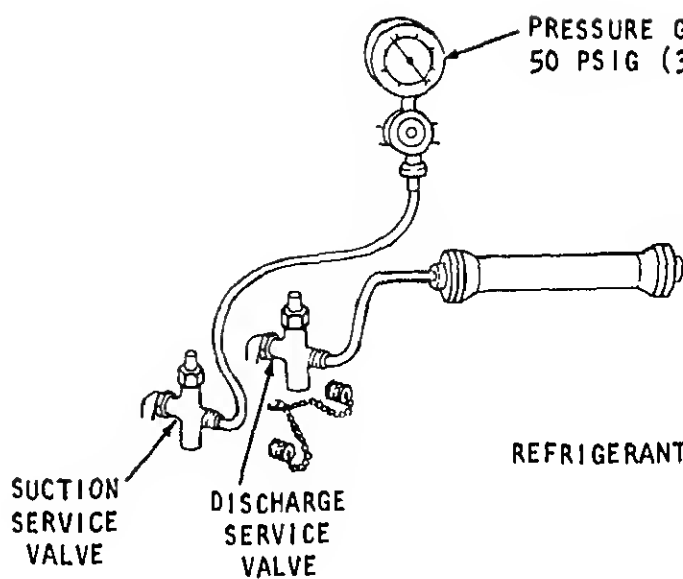
Test the refrigeration system after repair or replacement. Refer to figure 5-3 and proceed as follows:

1. Connect a pressure gauge to the suction service valve, and a refrigerant (item 11, table E-1) cylinder to the discharge service valve and the cylinder shutoff valve. Let the refrigerant flow into the system until the pressure gauge indicates 50 psig (3.4 bar). Close cylinder shutoff valve and disconnect the refrigerant cylinder.

2. Connect a cylinder of dry nitrogen (item 8, table E-1) to the discharge service valve. Open the cylinder shutoff valve and the discharge service valve, and pressurize the system to 350 psig (22 bar). Close all three valves, and test for leaks, using an electronic leak detector, or the soap bubble method as described in paragraph 5-13(4).

#### CAUTION

An electronic leak detector is sensitive to the presence of refrigerant gas (item 11, table E-1) in the atmosphere. When refrigerant gas is present in the atmosphere of the work area, false indications can result. Use in a well ventilated but refrigerant-free area.



CORRECTING REFRIGERANT

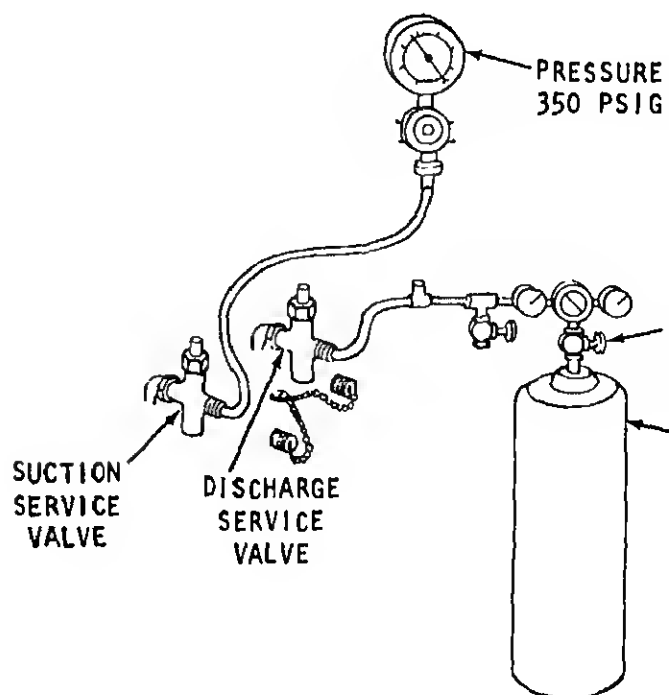


Figure 5-3. Leak Testin

the probe around all points of the refrigeration system at which a leak could exist. Depending upon the type of detector used, a leak is indicated by an audible signal, a light, or by meter reading.

**Soap Solution.** Brush soap solution on all possible points of the system and watch for bubbles. Follow a definite sequence to test all points that should be tested. Wipe the solution off the points, and mark any point at which a leak is found.

**Charge the system after leak testing** by connecting a hose to the suction service valve, and cracking the valve open slightly to charge the gas. Too rapid discharge will cause oil to be drawn into the compressor. If leaks were detected, repair them and retest as directed above. If the system is leak-tight, double evacuate the system as directed below.

#### CHARGING THE SYSTEM.

Before the system is charged with refrigerant, it must be evacuated to exhaust water vapor, non-condensable gases and air which would prevent the system from operating. See Figure 5-4 and proceed as follows:

#### NOTE

The following instructions are provided for use by refrigeration shops furnished with only the most basic equipment. If more sophisticated equipment, such as two-valve or four-valve service manifolds is available, it should be used by making appropriate modifications to these instructions.

Connect a vacuum pump to the suction service valve gauge port, and another gauge to the discharge service valve gauge port. Start and open both service valves. Operate the vacuum pump until the system is reduced to not more than 500 microns. Close the discharge service valve, and turn the vacuum pump off. Let the unit sit in this condition for at least three hours. If the system holds without change of pressure, continue with step b. If the vacuum cannot be held for three hours, break the vacuum with nitrogen and retest for leaks. If 500-micron vacuum cannot be held, one or more of the following reasons may account for the condition.

**Presence of water vapor in the system.** Continued pumping will not break this condition.

**Leaks in the refrigeration system.** Break the vacuum with nitrogen (item 8, table E-1), and retest for leaks (para 5-5).

**Internal leakage of vacuum pump.** Test the pump by connecting the vacuum gauge directly to the vacuum pump intake and continue to pump. If the pump still fails to reach 500 microns, the pump is faulty.

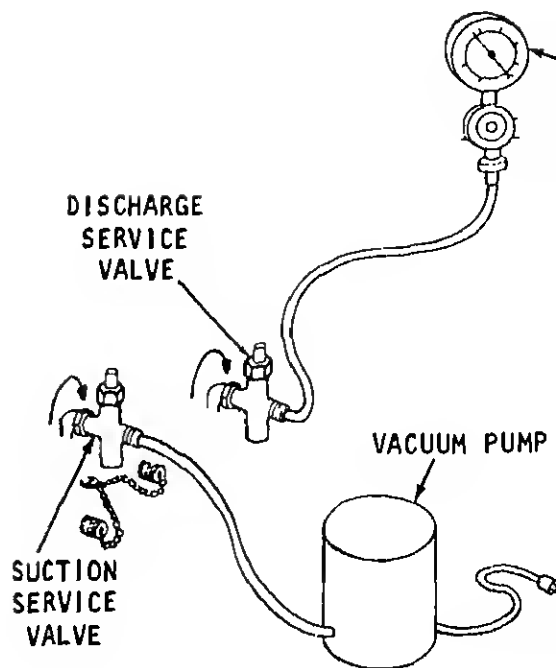


Figure 5-4. Evacuating the System

b. With the suction line service valve closed, connect the vacuum pump and attach a cylinder of dry nitrogen (see Figure E-1). Leave the connection to the suction service valve loose, and open the nitrogen cylinder shutoff valve for a few seconds to purge the line of air. Tighten the connection, and open the suction service valve slightly to break the vacuum. In this configuration until the system reaches atmospheric pressure (760 mm) then close the suction service valve and the nitrogen cylinder valve, and disconnect the nitrogen cylinder.

c. Reconnect the vacuum pump to the suction service valve, and start the pump. Open the suction service valve until a 500-micron vacuum is achieved. This will remove all traces of water vapor and non-condensable gases from the system. Close the suction service valve, and disconnect the vacuum pump. Close the discharge service valve, and remove the gauge.

CHARGING THE SYSTEM.

Charging the system use a manifold assembly similar to that in figure 5-5. Connect a manifold and a cylinder of refrigerant (table E-1), loosely to the service valves, and open the shutoff valve for a few seconds to purge the line of air. Make service valve connections. Charge the refrigeration system directed in the following steps:

**CAUTION**

Do not attempt to charge liquid refrigerant into the suction line. The compressor would be damaged.

**NOTE**

Two kinds of refrigerant cylinders are in general use. One is equipped with a single shutoff valve, and must be inverted when charging liquid refrigerant. The other is equipped with a vapor valve and a liquid valve, which makes it possible to charge either liquid or vapor when the cylinder is upright. When using the two-valve cylinder; disregard instructions to position the shutoff valve down, and connect the service line to the liquid valve instead.

Place the refrigerant cylinder on a scale of sufficient capacity with the shutoff valve down, or suspend the cylinder from a beam scale, with the valve end down.

Weigh the cylinder, and record the weight.

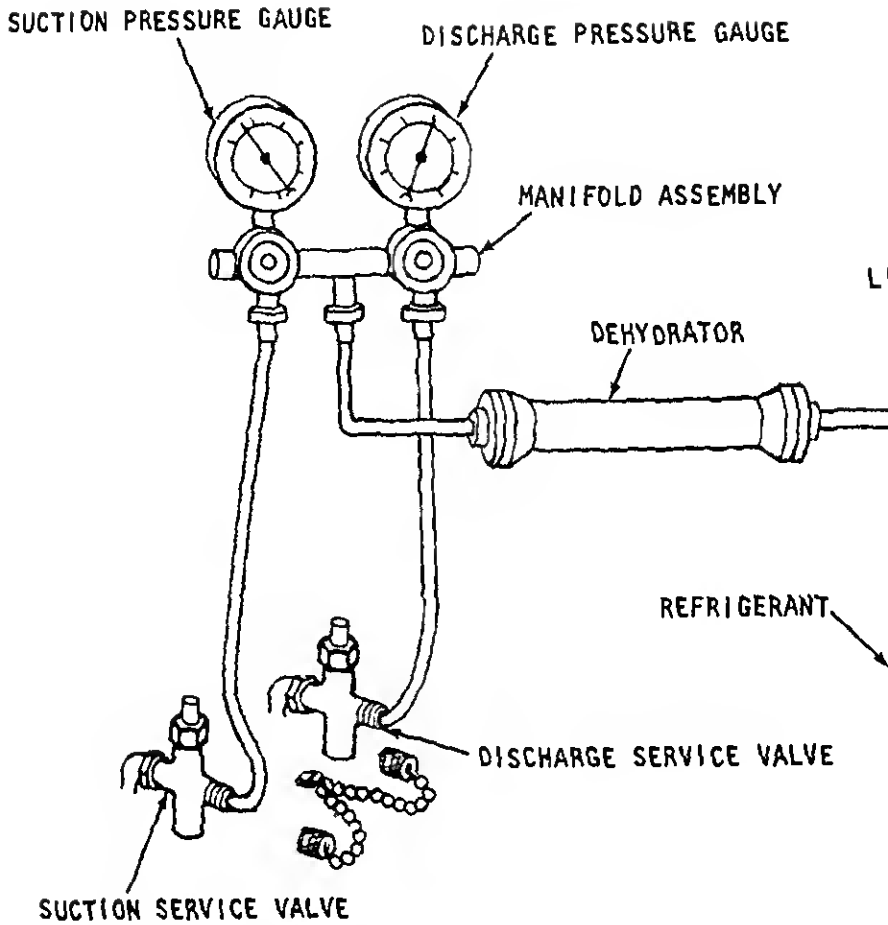
Close the discharge service valve, and slightly open the shutoff valve. Liquid refrigerant will be sucked into the system rapidly at first, then more slowly as pressures equalize. When 5.0 pounds (2.27 kg) of refrigerant have entered the refrigeration system, close the discharge service valve and the cylinder shutoff valve.

**NOTE**

The junction box and control panel assemblies and the power panel must be in place to operate the air conditioner and to complete the charging operation. If they were removed for maintenance, install them now, in accordance with paragraphs 4-24 and 4-28.

Check operation and top off refrigerant as necessary, in the manner.





NOTES

1. THE VAPOR VALVE IS NOT USED ON A TWO VALVE SYSTEM.
2. IF A ONE VALVE CYLINDER IS USED INVERT THE CYLINDER.

## CAUTION

If knocking or pounding is heard when starting the air conditioner, shut down at once and release some refrigerant before attempting another start.

With power connected to the air conditioner, turn the rotary switch to COOL and the temperature control thermostat to the INCREASE position. Let the air conditioner operate for 15 minutes in this mode, then observe the sight-glass liquid indicator. The air conditioner is running. If bubbles or milkiness appear in the sight-glass, the refrigerant charge is low. The correct refrigerant charge is as follows:

With the air conditioner compressor operating, open the service valve and the cylinder shutoff valve to charge refrigerant into the system. Continue to observe the sight-glass liquid indicator. When the liquid in the sight-glass liquid indicator runs free of bubbles, close the suction service valve and the shutoff valve.

When the liquid in the sight-glass liquid indicator runs free of bubbles, close the suction service valve and the shutoff valve.

Disconnect the manifold assembly and the refrigerant and pressure-test the air conditioner.

## PRESSURE TESTING.

Pressure testing the refrigeration system is an important procedure which you should perform whenever the system has been recharged after replacement of a component or when the air conditioner is operating inefficiently. Pressure testing is accomplished by connecting individual pressure gauges or a refrigeration manifold to the suction line and discharge line service

description. Every refrigeration system has its own specific pressures for the suction and discharge sides of the compressor at a given ambient temperature. The temperature-pressure charts for the air conditioner are shown in Table 5-2.

TABLE 5-2.

NORMAL TEMPERATURE - PRESSURE RELATIONSHIPS				
95°F (35°C) dry bulb return air to unit				
Outdoor ambient temperature	50°F 10°C	75°F 24°C	100°F 38°C	110°F 43°C
Gauge Pressures				
Suction <sub>2</sub> (psi) (Kg/Cm <sup>2</sup> )	56-60 3.93-4.22	56-65 3.93-4.57	65-75 4.57-5.27	70-80 4.92-5.62
Discharge <sub>2</sub> (psi) (Kg/Cm <sup>2</sup> )	135-155 9.50-10.90	185-205 3.00-14.41	275-295 19.33-20.74	375-395 26.3-27.6
80°F (27°C) dry bulb return air to unit				
Outdoor ambient temperature	50°F 10°C	75°F 24°C	100°F 38°C	120°F 50°C
Gauge Pressures				
Suction <sub>2</sub> (psi) (Kg/Cm <sup>2</sup> )	56 min. 3.93 "	56 min. 3.93 "	56-65 3.93-4.57	65-75 4.57-5.27
Discharge <sub>2</sub> (psi) (Kg/Cm <sup>2</sup> )	130-150 9.14-10.55	180-200 12.65-14.06	270-290 18.98-20.39	370-390 26.0-27.0

NOTE: Dry bulb temperatures are measured with an ordinary thermometer.

b. Set up. Prepare the air conditioner for pretest as shown in figure 5-6 and as directed in the following steps.

(1) Make sure that the fresh air damper is closed, and that the evaporator air intake and discharge grilles are fully open.

(2) Hang an accurate thermometer directly in the evaporator air intake grille to register "dry bulb temperature."

(3) Hang an accurate thermometer directly in the condenser coil guard, making sure that the thermometer is not in direct sunlight, to record "outdoor ambient temperature."

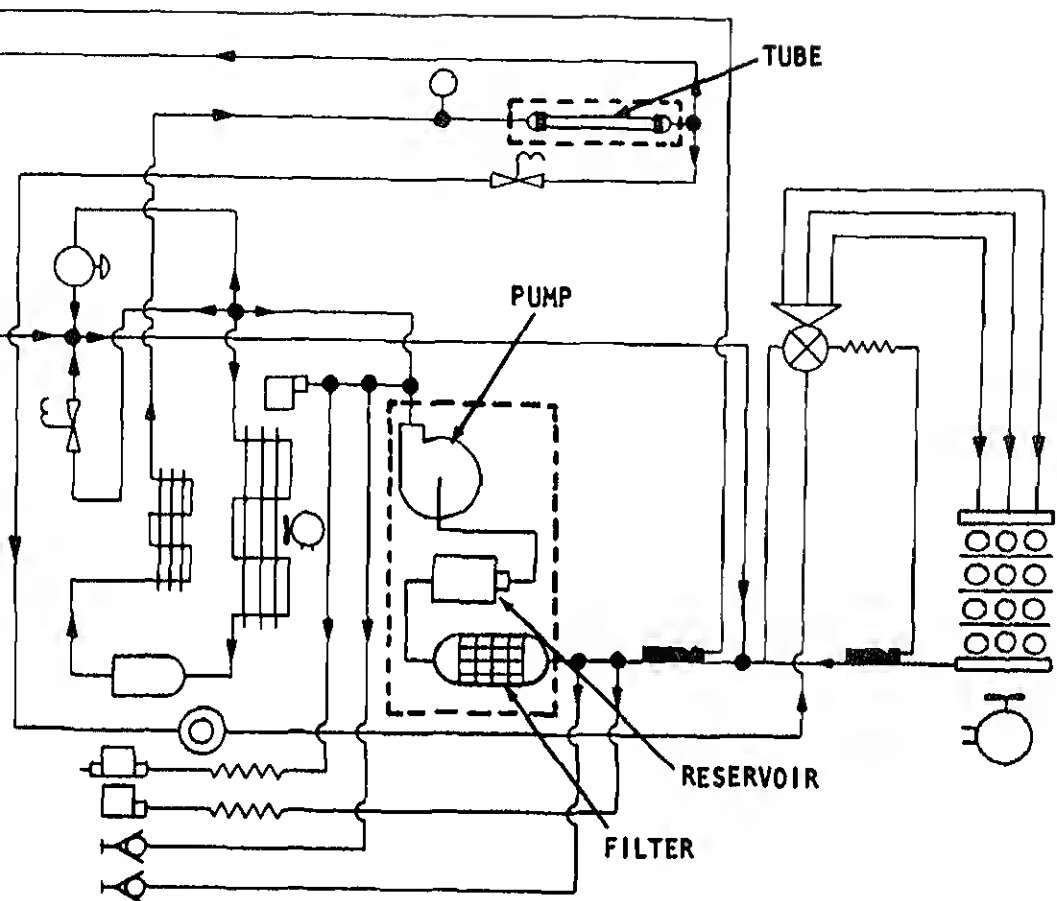


Figure 5-6. Pressure Testing.

or a refrigeration service manifold to the suction service valve ports, purging the manifold of any lines.

(5) If indoor ambient temperature is too low, heater to raise the "dry bulb to return air to un 80°F (27°C).

c. Procedure. Perform the pressure test in the

(1) Turn the rotary selector switch to COOL control thermostat to maximum DECREASE.

(2) Slowly open the suction line and discharge valves to which pressure gauges have been connected.

(3) Let the air conditioner operate for at least 15 minutes in the cooling mode, so that all parts of the system reach equilibrium.

(4) Record the temperatures indicated by both thermometers and the pressures indicated by both pressure gauges.

(5) Compare the readings obtained from pressure gauges with the normal ranges shown in Table 5-2.

d. Analysis of Discrepancies. If actual pressure-temperature relationships differ from those shown in Table 5-2, check for the following reasons, and take appropriate action.

(1) If pressures are too low: Check for leaks (paragraph 5-5), repair, recharge the system (paragraph 5-6), and repeat the pressure test.

(2) If pressures are too high: Close the service valves, remove the pressure gauge, and bleed off the appropriate amount of refrigerant. Repeat the pressure test.

(3) If discharge pressure is extremely high and suction pressure is extremely low, blockage may exist in the refrigerant line. Troubleshoot, correct the trouble, recharge if necessary, and repeat the pressure test.

e. Completion. After pressure testing has been completed, close both service valves, remove gauges and thermometers, install fresh air screen, and secure it. Remove thermometers from the unit.

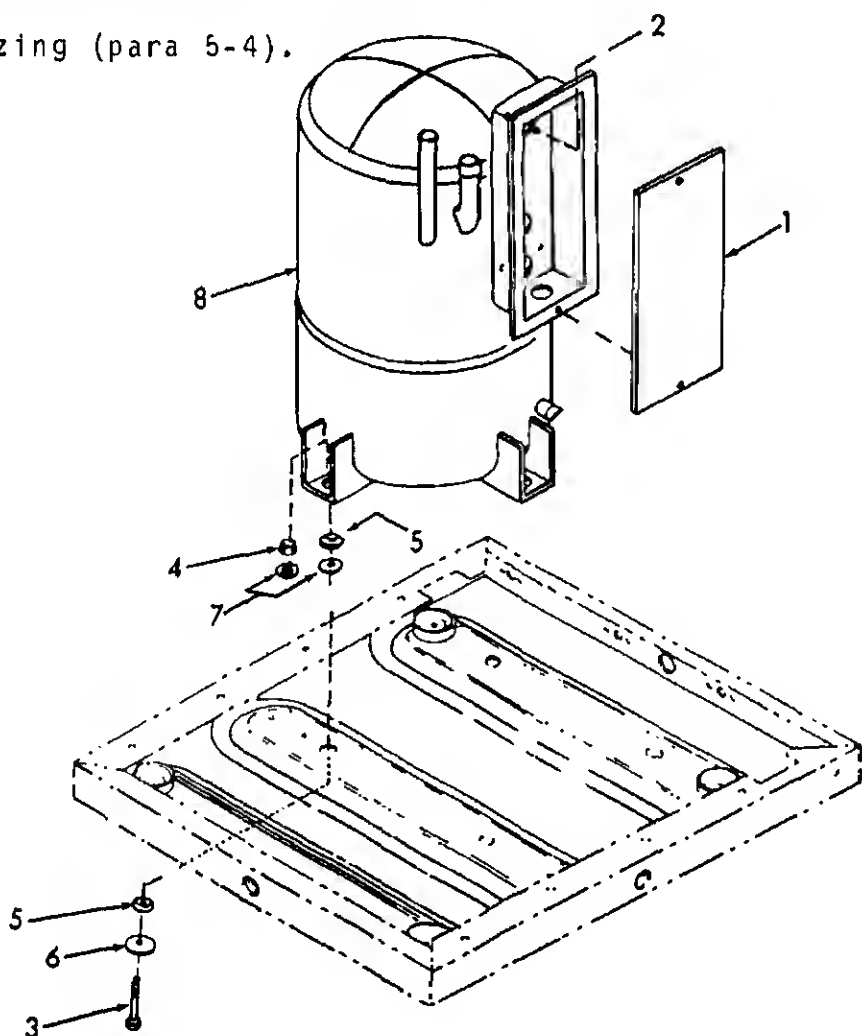
ESSOR.

tion.

refrigeration compressor is a self-contained unit which includes a reciprocating compressor, a drive motor and a life time oil hermetically sealed into a dome-shaped steel housing. A type crankcase heater is mounted around the outside of the housing near the base. The purpose of the crankcase heater is to prevent migration of liquid refrigerant into the compressor in the event of a shutdown. Liquid refrigerant could mix with the oil, causing the oil to be pumped throughout the system. Also, fluids are incompressible and could cause serious damage to the compressor if permitted to enter while operating.

Primary Requirements.

- ) System discharge (para 5-3).
- ) Remove lower panel (para 4-12).
- ) Remove junction box (para 4-28).
- ) Compressor tests (para 4-40.1).
- ) Debrazing (para 5-4).



(1) Remove junction box cover (1).

(2) Disconnect plug P4 (2) from junction box.

**CAUTION**

When hoisting the air conditioner by means of a sling through the handles, use a spreader bar to prevent the sling damaging the casing.

(a) Hoist the air conditioner onto support height to permit insertion of a socket wrench through mounting holes in the base plate.

(b) Remove four shoulder bolts (3) and nuts (5) and eight of each size of washers (6 & 7) from legs of the compressor (8).

(c) Lever the compressor up, and slide it into the air conditioner.

d. Installation.

**NOTE**

If refrigeration piping was disconnected when the compressor being replaced, transfer the piping to the replacement compressor before installing the air conditioner.

(1) Mounting. Set the compressor in place on the base plate of the air conditioner. Level the unit, lift up, and insert bushings (5) and washers (6 & 7) into support feet. Install shoulder bolts (3) and nuts (5) from below, and install nut (4) on top of mounting foot.

(2) Tubing Connection. Provide a 1-2 inch flow of dry nitrogen (item 8, table 1) to the refrigeration system, and braze tubing to the compressor.

(3) Replacement of Filter-Drier.

**NOTE**

Whenever the refrigeration system has been repaired, a new filter-drier must be installed before operation. (See para 5-15).

- ) Replace junction box (para 4-28).
- ) Replace lower panel (para 4-12).
- ) Test, evacuate and recharge system as per paragraphs 5-5 through 5-8.

#### COMPRESSOR MOTOR BURNOUT.

Failure of a compressor motor is indicated by lack of continuity in the motor windings and the condition of compressor oil, which must be checked after the compressor has been removed from the refrigeration system. Causes of compressor motor burnout include the

1. Low line voltage, which causes motor windings to overheat. If the motor burns out completely, the overheated windings cause chemical decomposition of the refrigerant and the oil to form sludge and other contaminants.

2. Low charge of refrigerant. An inadequate charge of refrigerant gas in the system reduces the amount of cooling gas within the compressor, resulting in gradual overheating of the motor and failure of the

3. High head pressure. High head pressures can be caused by dirty condenser coils or screens, or by an inoperative fan. High head pressure requires the compressor to work against additional heat which ultimately can result in motor burnout. Poor ventilation around the condenser, and extremely high temperatures can also cause motor failures.

4. Contamination in system. Leakage of air into the refrigeration system starts a chain reaction which can result in motor burnout. Air, oxygen and moisture which combine with refrigerant gas to form hydrochloric and hydrofluoric acids. These combine with compressor oil to form an acid sludge which is carried throughout the system and attacks the motor windings, causing short circuits and

#### DIAGNOSING COMPRESSOR MOTOR BURNOUT.

It is important to diagnose the type of compressor motor failure before repairs. Simple failure, without motor burnout, does not require extensive cleaning of the entire refrigeration system. If there is a burnout, however, extensive cleaning is required. Also, motor burnout indicates other problems that contributed to the failure, and these problems must be corrected to prevent repetition of the burnout. After removal of the compressor from the refrigeration system, remove all external oil. Tip the compressor toward the discharge port to drain a quantity of oil into a clear glass container. If the oil is clear, and does not have an acrid smell, the compressor did not



sludge and has an acrid odor, the compressor fails, or a burnout, and the refrigeration system must be cleaned of residual contaminants from causing repeated burnouts or is replaced.

## 5-10.2 CLEANING OUT THE REFRIGERATION SYSTEM AFTER A BURNOUT

You must clean the entire refrigeration system after a burnout has occurred, since contaminants will have been in the corners and restrictions in the piping and fittings. Contaminants will soon mix with new refrigerant gas and cause repeated burnouts. To clean the system the following steps must be followed:

a. Remove the filter-drier (para 5-15), and install a new one in the refrigeration system. To do this, connect a nitrogen cylinder (item 8, table E-1) to each filter-drier and open the cylinder shutoff valve for at least 3.5 kg/cm<sup>2</sup> pressure.

b. Connect the two filter-drier fittings with a pipe manufactured from refrigerant tubing and fittings to a reservoir and filter in place of the compressor (para 5-15).

c. Disassemble both expansion valves and temporary valve cages. Re-install shell of power assembly, and a new gasket between power assembly and body. Tag and retain valve cages for use at reassembly.

### NOTE

An unused filter-drier or other suitable device may be used as the filter.

d. Fill reservoir with fluorocarbon refrigerant (table E-1) and start the pump. Continue filling the reservoir until it begins to pour out of the return line. Flush for at least 15 minutes.

### NOTE

During flushing and back-flushing operation, apply 24 volts, dc, to the bypass line solenoid for a total of approximately 10 minutes of each. This will ensure that the cleaning solvent flows through all parts of the system.

e. Reverse the pump connections, replace the filtering medium, and back-flush the system for at least 15 minutes.

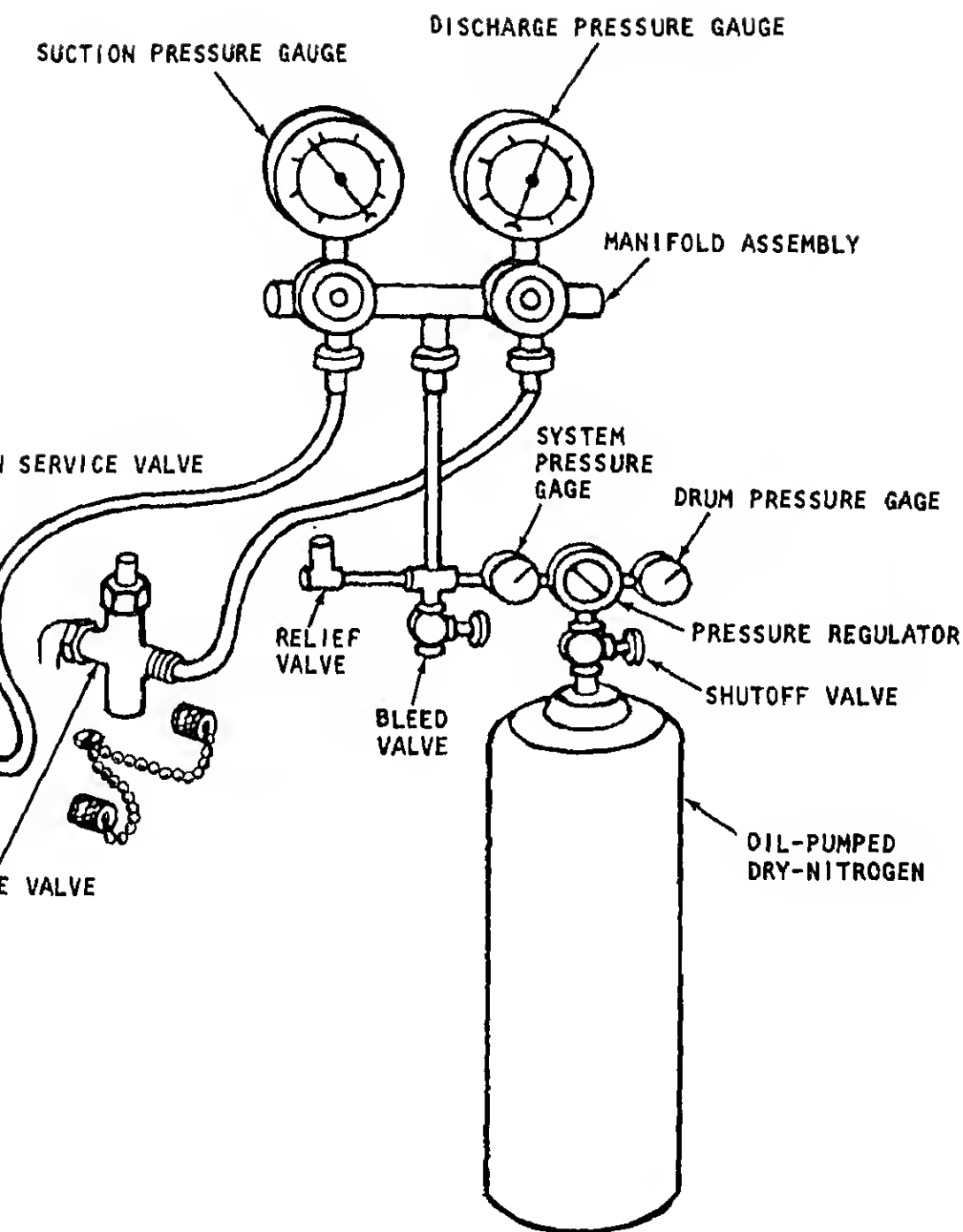


Figure 5-6A. Typical Flushing Hook-up.

1. Remove the pump, reservoir, filter and filter. Place an empty container below the compressor connection a cylinder of dry nitrogen (item 8, table E-1) to each connection in turn. Blow down each leg of the system ( $\text{kg/cm}^2$ ) for at least 30 seconds.

g. Disassemble both expansion valves and re-install valve cages. Install new gaskets, and assemble the valve cages. Projections on valve cages fit in notches in valve bodies.

h. Disconnect the dry nitrogen cylinder, and install a new filter-drier, making sure that the direction of flow points up. Cap or plug compressor connections if caps are to be installed immediately.

i. Replace compressor, evacuate and charge system.

## 5-11. PRESSURE SWITCHES.

### a. Description.

The pressure switches, high pressure, low pressure (fan speed) are located in the same assembly. This assembly is at the rear of the air conditioner near the fresh air screen. If the high pressure switch requires replacement, all of the switches must be disconnected and the assembly removed as one unit.

### b. Preliminary tests.

High/Low Pressure (para 4-41.1).

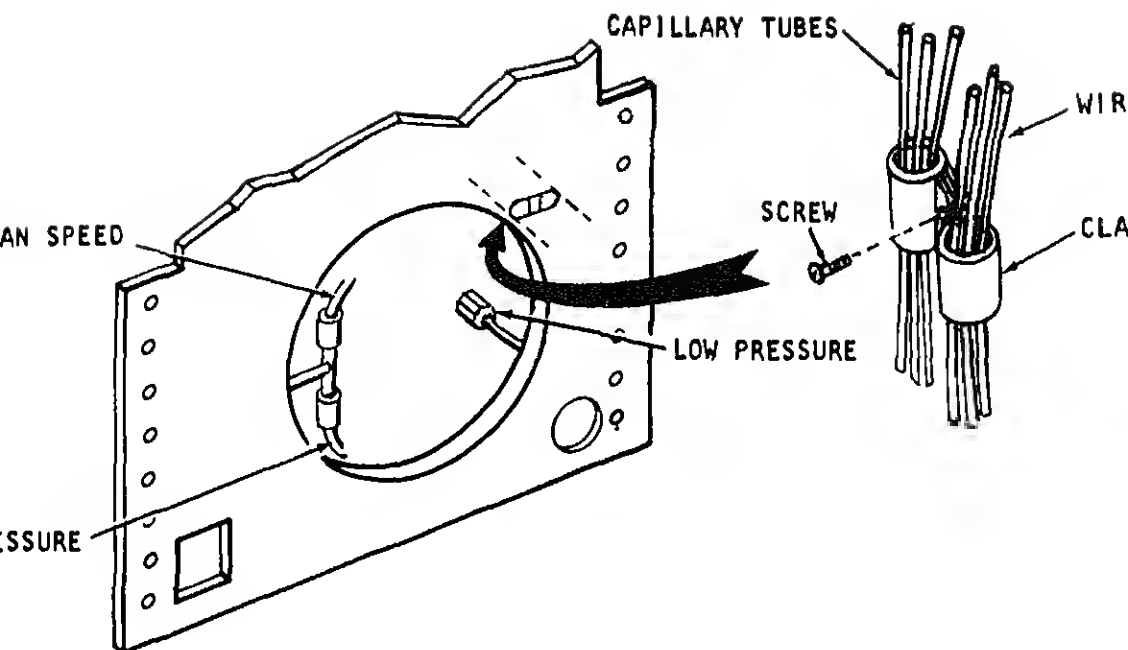
Pressure Switch (para 4-41.2).

## WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

### c. Preliminary Requirements.

- (1) Remove fresh air screen (para 4-14).
- (2) Discharge system (para 5-3).
- (3) Remove canvas cover (para 4-8).
- (4) Remove top panel (para 4-9).
- (5) Remove condenser fan guard (para 4-16).
- (6) Remove condenser fan (para 4-44.2).



oval.

- (1) Remove screws (1) near each end of the pressure switch reset information plate (2).
- (2) Leave pressure switch assembly in place.

### WARNING

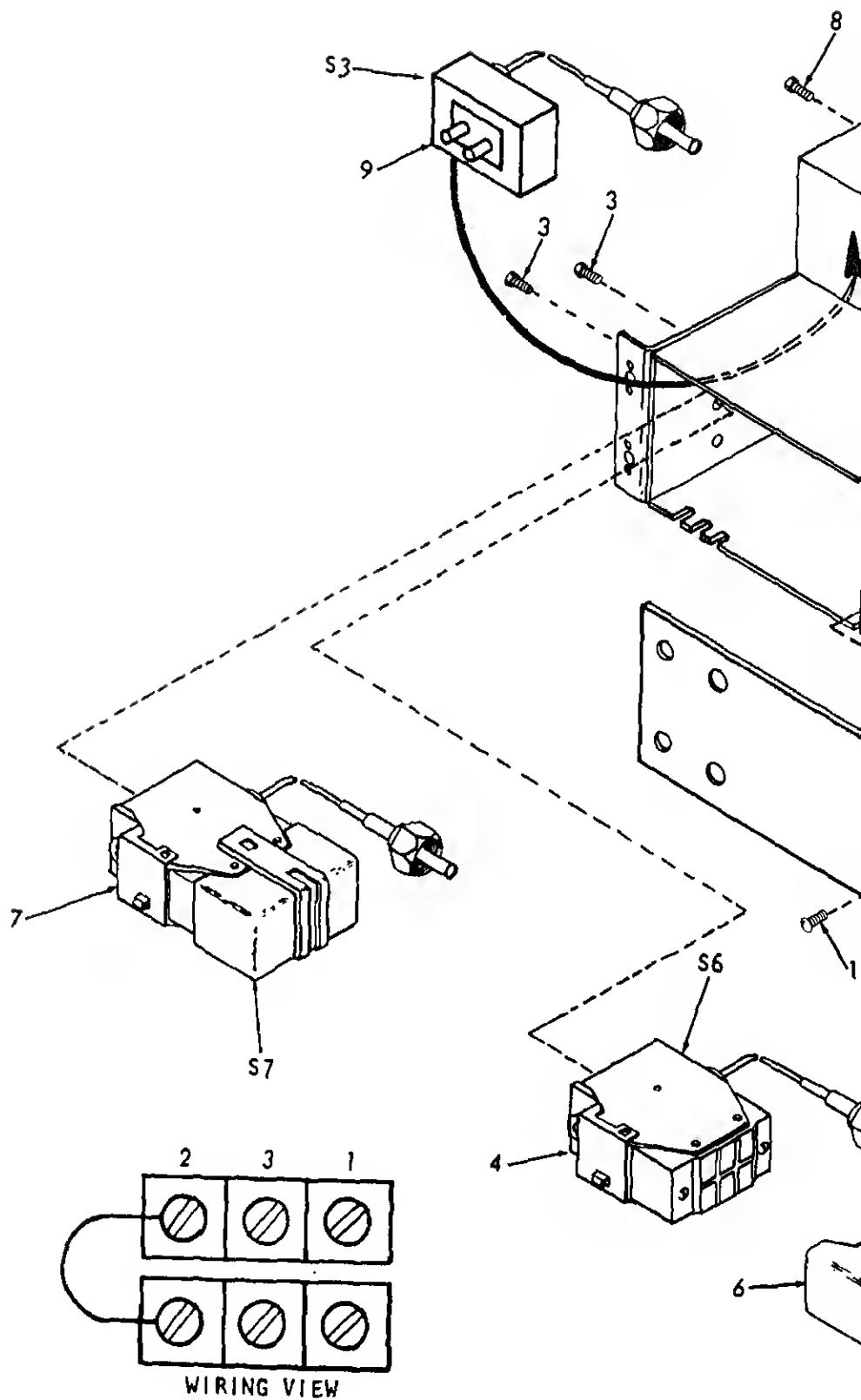
Do not perform the following operation until all refrigerant has been discharged from the system (para 5-3). Escaping refrigerant gas under pressure can cause permanent tissue damage from sudden freezing.

- (3) Reach into the upper right corner and remove clamp securing capillary tubes and wiring harness.

### NOTE

It is not necessary to remove all pressure cut-out switches.

- (4) Both the high and low pressure cut-out switch connections to the refrigeration system are located near the compressor, the low-pressure cut-out switch in a cross fitting in the suction line, and the high-pressure switch in a tee fitting (across from the pressure control switch) in the discharge line.



fitting) unscrew the connection of the defective pressure cut-out switch.

- 6) Carefully withdraw pressure cut-out switch housing from the top of the air conditioner, leading capillary tubes and electrical wires out as the housing is raised.

#### NOTE

The pressure cut-out switch housing is not removed from the unit.

assembly.

- 1) Remove screws (3) in the end of the housing, and remove both the high and low pressure cut-out switches (4 & 7). Be careful to avoid kinking the capillary tubes when removing them from the notches in the edge of the housing.
- 2) Pry off spring clip (5) on end of pressure cut-out switch, and remove the spring clip (5) and the cover (6) from the wire connections. Disconnect wires as necessary.
- 3) Remove screws (8) in the end of the housing and remove the fan speed pressure switch (9).
- 4) Disconnect wires as required.

- 1) Test the high-pressure cut-out switch (S7) as follows:
  - (a) Connect the high-pressure cut-out switch to an ohmmeter, multimeter or other continuity testing device.

#### CAUTION

Do not use compressed air for testing the pressure cut-out switches. Oil, moisture and other impurities could be carried into the refrigeration system.

- (b) Connect the capillary flare nut to a cylinder of dry nitrogen (item 8, table E-1), and slowly pressurize the switch assembly.
- (c) When pressure gauge indicates 415 psig (29.17 kg/cm<sup>2</sup>) press and release reset button. Continuity should be indicated.

- (d) Continue to pressurize the switch. When pressure reaches 32.34  $\pm$  0.7 kg/cm<sup>2</sup>, continuity should drop out.
  - (e) Slowly reduce pressure to 415  $\pm$  1  $\pm$  0.7 kg/cm<sup>2</sup> and press reset button. Continuity should be indicated.
- (2) Test the low-pressure cut-out switch
- (a) Connect the low-pressure cut-out continuity tester and the source (see Figure E-1), as directed in step 8.
  - (b) Slowly pressurize the switch to 29.17 kg/cm<sup>2</sup> and press reset button. Continuity should be indicated.
  - (c) Continue to pressurize the switch (29.17 kg/cm<sup>2</sup>). Continuity should be at all times.
  - (d) Slowly reduce pressure. Continuity should drop out at 7  $\pm$  5 psig (0.5  $\pm$  0.35 kg/cm<sup>2</sup>).
  - (e) If pressure-continuity requirements are not met, replace the pressure cut-out switch.
- (3) Test the fan speed pressure switch (S)

**CAUTION**

Do not use compressed air to pressurize the switch. Traces of oil, moisture and other contaminants may be carried into the refrigeration system.

- (a) Connect a cylinder of dry nitrogen (see Figure E-1) to the body of the pressure continuity tester. Pressurize the switch.
- (b) Observe the pressure gauge and the continuity tester. Continuity should be indicated when pressure reaches 400  $\pm$  16 psig (27.6  $\pm$  1.13 kg/cm<sup>2</sup>).
- (c) Gradually reduce pressure to the fan speed pressure switch, observing the pressure gauge and the continuity tester. Continuity should drop out at 24.6  $\pm$  1.13 kg/cm<sup>2</sup>.
- (d) Replace the pressure switch if it does not meet pressure and continuity requirements.

- ) If all of the wires to the assembly have been removed. Install a 7/16-inch grommet in the hole in one end of the housing. Cement in place. Pull wire leads through the hole in the grommet.
- ) Attach wires to the fan speed pressure switch (9).
- ) Install a split grommet on the capillary tube and insert grommet in left-hand notch.
- ) Insert the fan speed pressure switch (9) and secure with screws (8).
- ) With terminal covers removed from both pressure cutout switches, connect the short wire from terminal 2 of the high-pressure switch to terminal 2 of the low-pressure switch.
- ) Connect wire leads to terminal 2 of the high-pressure switch and to terminal 1 of the low-pressure switch. Tag the leads for identification. Install both terminal covers (6) and retaining clips (5).
- ) Install a split grommet on both capillary tubes, and insert the low-pressure cutout switch (4) in the lower part of the housing. Secure with two screws (3). Form the capillary tube along the back of the housing to the middle notch.
- ) Insert the high-pressure cut-out switch (7) in the upper part of the housing. Lead capillary tube to the remaining notch. Secure switch with two screws (3). Install capillary tubes and grommets in notches. Tag connecting end for identification.

ation.

- ) Slowly lower the pressure switch assembly into the top of the unit while guiding the capillary tubes into their proper positions. Avoid kinking the capillary tubes.
- ) Using a wrench on each side of the joint tighten the connections.
- ) Replace clamp and screw that secures wiring and capillary tubes.
- ) Replacement of filter-drier.

#### NOTE

Whenever the refrigeration system has been opened, new filter-drier must be installed before recharging. (See para 5-15.)



- (6) Close service valves and remove gauge valves.
- (7) Replace condenser fan (para 4-44.2).
- (8) Replace condenser fan guard (para 4-44.3).
- (9) Replace top panel (para 4-9).
- (10) Replace canvas cover (para 4-8).
- (11) Replace fresh air screen (para 4-14).

#### 5-12. REFRIGERANT COMPONENTS.

The following sections contain the replacement and servicing procedures for the refrigerant components. Paragraphs 5-5 through 5-7 for component orientation.

#### 5-13. REFRIGERANT TUBING.

Refrigerant tubing is seamless copper which has a bright finish to permit thorough cleaning and to prevent contamination or other impurities. Both rigid and soft grades are used depending upon whether the tubing is to be bent or is to be used in straight runs. Sharp changes of direction are accomplished by the use of fittings such as elbows, tees and crosses. Connections are made by soldering or brazing, and by flare fittings.

##### a. Inspection/Test.

Inspect tubing and fittings usually for leaks. Check for kinks. If damage appears to be minor, test by pressure (see paragraph 5-5). If no leaks are detected, the tubing is serviceable.

##### b. Removal/Installation.

- (1) General. The refrigeration system must be evacuated and discharged before removing any part. If brazing or debrazing is required for removal, a dry nitrogen (item 8, table E-1) must be used to purge through the system while the joint is being brazed. Any refrigerant gas, if released, will cause the system to become contaminated and would cause serious corrosion. The system must be evacuated to the brazing or debrazing temperature.
- (2) Heating. Sufficient heat should be applied around the joint to reach the melting point of the filler metal quickly. Slow or non-uniform heating permits heat to be conducted away from the joint, sometimes melting an adjacent joint instead of the one intended.

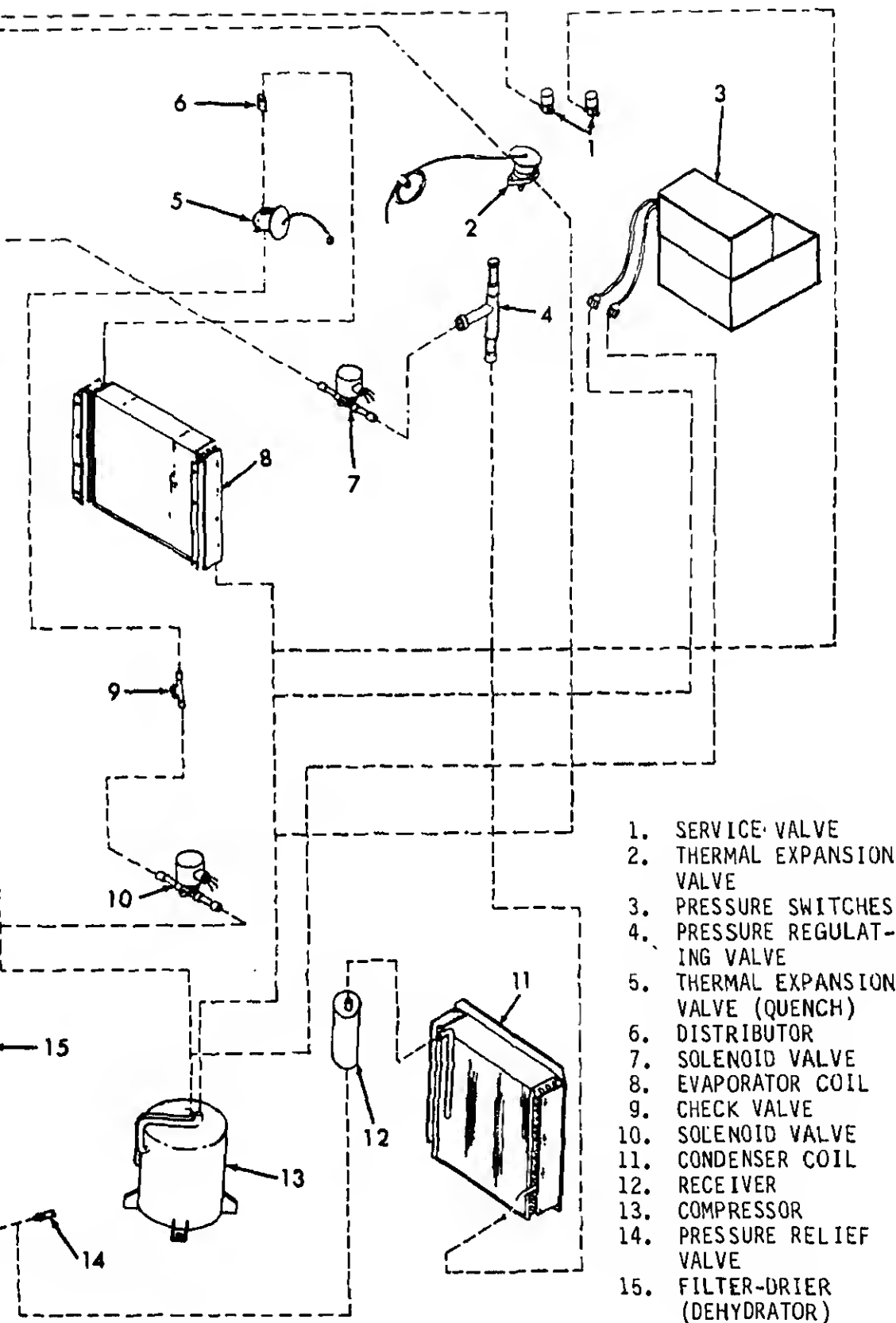


Figure 5-7. Refrigeration Components.

- (3) Cleaning. Residual filler metal, cleaned by heating the tube in the following manner:

**WARNING**

Wear welders gloves or other thermal protection gloves when performing the following operations:

- (a) Fold a piece of fiber-glass cloth (E-1) about 6 x 6 inches and wrap it around the tubing, a few inches away from the end to be cleaned.
  - (b) Heat the tubing at the end to be cleaned until the braze filler metal is thoroughly melted.
  - (c) Grasp the fiberglass wrapping at the end with a two-pronged tong and pull it over the tubing end with a twisting motion.
- (4) Protection from heat.

**WARNING**

Polyurethane foam insulation breaks down and releases toxic gases when heated to brazing temperatures.

- (a) When brazing/debrazing refrigerant fittings near an insulated wall or ceiling, fabricate a sheet metal shield to keep the flame of the torch away from the insulation. Perform the operation in a well-ventilated area.
- (b) When brazing/debrazing tubing, valves, solenoid valves or other components, the component could be warped or damaged by the heat. The component should be disassembled to the extent possible, and the body of the component should be cooled. If disassembly is impractical, the entire component, except for the part being heated, should be wrapped in a heat sink.

#### 5-14. SOLENOID VALVE REPLACEMENT.

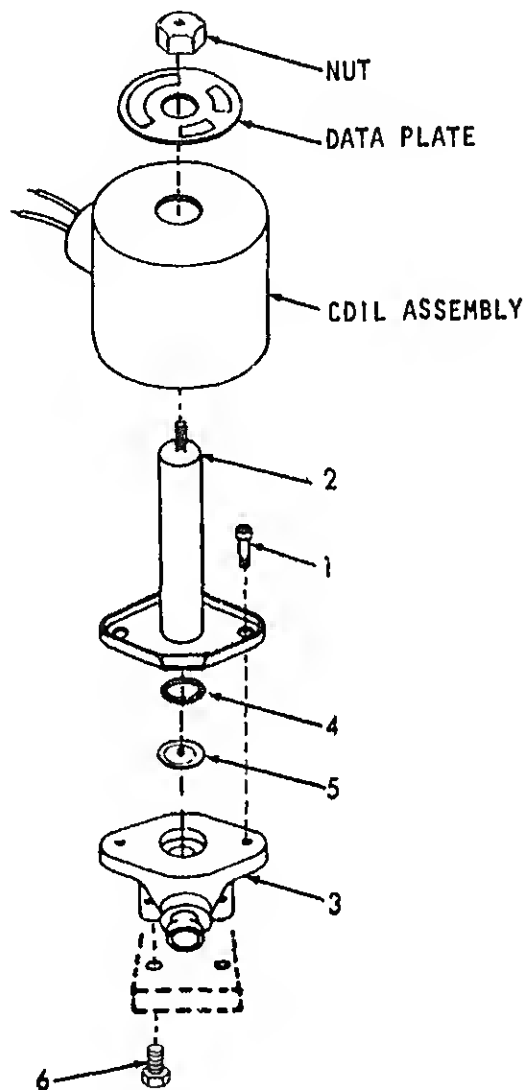
##### a. Description.

Two solenoid valves are used in the air conditioning system to close/open the liquid refrigerant line from the condenser to the evaporator coil expansion valve, the other to close/open the equalization circuit from the discharge side of the compressor to the suction side. Both valves are alike; however the

the unit, while the pressure equalizer solenoid valve is located in the upper rear part of the air conditioner.

#### Preliminary Requirements.

- (1) Discharge system (para 5-3).
- (2) Solenoid testing (para 4-42.1).



#### Removal.

If it is necessary to replace the tube and plunger assembly, diaphragm and O-ring, or the entire valve, proceed as directed in the following procedure:

**CAUTION**

All gas must be discharged from the refrigeration system before the system is opened for maintenance (para 5-3).

- (1) Remove coil assembly as directed in paragraph 4-42.2.
- (2) When refrigerant is completely discharged from the system, remove the two screws (1) that fasten the tube and plunger assembly (2) to the body (3). Remove tube and plunger assembly (2), O-ring (4), and diaphragm (5) and discard.
- (3) If valve body is serviceable, install replacement parts. If valve body is warped or is otherwise unserviceable, connect a cylinder of dry nitrogen to the discharge service valve, and establish a flow of 1-2 (0.1 - 0.2 M<sup>3</sup>/min) through the system. Debraze the valve body from the refrigerant tubing.
- (4) Remove two mounting screws (6) attaching the valve body to the mounting bracket. Remove the solenoid valve body.

### Installation.

- (1) If valve body (3) was removed, install new body, secure to mounting bracket with two screws (6) and attach pipe connections to body, disassembled from remainder of assembly.
- (2) Wrap the body between the tubing connection in wet cloth, and start a 1-2 cfm (0.1 - 0.2 M<sup>3</sup>/min) flow of dry nitrogen (item 8, table E-1) through the system. Braze connections. When cool, remove cloth and continue assembly.
- (3) Install O-ring (4) in groove in tube and plunger assembly (2) and place diaphragm (5) in recess in valve body with the metal buffer plate and seat on top.
- (4) Carefully place tube and plunger assembly (2) on valve body (3) and secure with two screws (1). Tighten uniformly.
- (5) Install coil assembly as instructed in paragraph 4-42.2.
- (6) Install a new filter-drier as per paragraph 5-15 and leak test as directed in paragraph 5-5.
- (7) Replace the components removed (para 4-42.1).
- (8) Test, evacuate, and recharge system as per paragraphs 5-5 through 5-8.

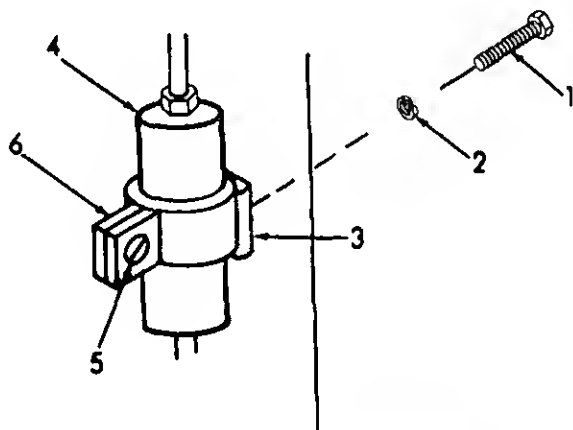
## 5. FILTER-DRIER (DEHYDRATOR).

### Description.

The filter-drier assembly is a metal container which contains dehydrating and filtering media through which the liquid refrigerant flows from the condenser coil to the evaporator coil. A filter-drier must be installed in the system whenever the system is opened. The filter-drier is located above and to the right of the compressor in the lower part of the air conditioner. It is connected to the refrigerant piping by flare nuts for easy removal.

### Preliminary Requirements.

- (1) Remove lower panel (para 4-12).
- (2) Remove junction box (para 4-28).
- (3) Remove fresh air screen (para 4-14).
- (4) Discharge system (para 5-3).



### WARNING

All refrigerant gas must be discharged from the system (para 5-3) before proceeding with the removal of the filter-drier (para 5-15).

### Removal.

- (1) When all refrigerant has been discharged, remove screw (1) and washer (2) from the outside of the flange that holds the filter-drier band clamp (3).

- (2) Unscrew the tubing flare nuts from the top and bottom connections of the filter-drier (4). Remove the filter-drier and band clamp.
- (3) Loosen the clamping screw (5) on the band clamp (6) and slide the band clamp from the filter-drier.

#### Installation.

- (1) Install a new filter-drier (4) in the band clamp (6) and tighten screw (5), in such a way that the direction-of-flow arrow will point up when installed.
- (2) Install the filter-drier and band clamp in the air conditioner, and secure with the screw (1) and washer (2) removed previously. Check again to be sure that direction-of-flow arrow is pointing up.
- (3) Connect refrigerant tubing to the flare fittings on top and bottom of the filter-drier.
- (4) Leak-test in accordance with paragraph 5-5.
- (5) Replace the components removed in the preliminary requirements, items 1 and 2.
- (6) Test, evacuate, and recharge system as per paragraph 5-5 through 5-8.
- (7) Remove gauges, and replace caps on service valves.
- (8) Replace fresh air screen as per paragraph 4-14.

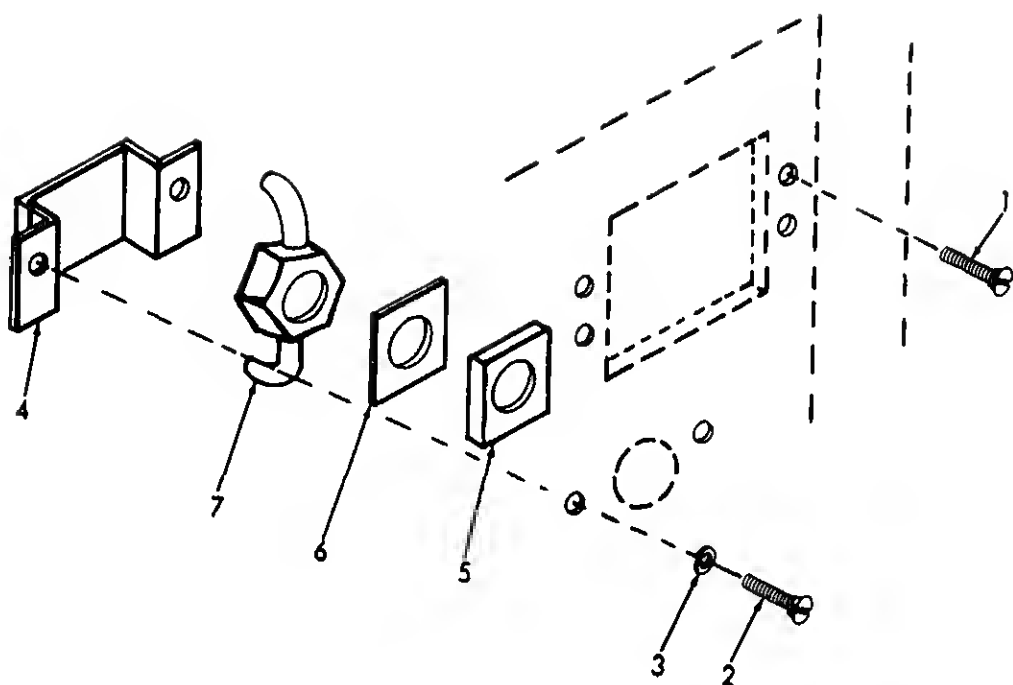
#### SIGHT GLASS REPLACEMENT.

##### Description.

The sight-glass liquid indicator is a circular sealed window in the liquid side of the system between the liquid line solenoid valve and the evaporator coil expansion valve. The indicator is located on the rear surface of the air conditioner, below the pressure cutout switches.

##### Preliminary Requirements.

- (1) Remove fresh air screen (para 4-14).
- (2) System discharge (para 5-3).
- (3) Remove canvas cover (para 4-8).
- (4) Remove top panel (para 4-9).
- (5) Debrazing (para 5-4).



### WARNING

All refrigerant gas must be discharged from the system, and a flow of dry nitrogen connected to the discharge service valve before removing the sight-glass (para 5-3).

a1.

- (1) Remove the four screws (1) from the ends of the pressure switch housing, and move the housing aside to permit access to the sight-glass liquid indicator.
- (2) Remove two screws (2) and lockwashers (3) from the sides of the bracket (4) and remove the bracket and spacer (5) and gasket (6) from inside the air conditioner.
- (3) With dry nitrogen flowing through the system, debraze joints of the sight-glass liquid indicator, remove the sight-glass (7) from inside the air conditioner.

11lation.

- (1) Connect tubing to sight-glass (7) and place gasket (6) and spacer (5) between sight glass and casing.



- (2) Place bracket (4) over back of sight-glass assembly secure through the casing with two screws (2) and lockwashers (3).
- (3) With dry nitrogen (item 8, table E-1) flowing through system at 1-2 cfm (0.1 - 0.2 M<sup>3</sup>/min), braze tubing joints to sight-glass liquid indicator.
- (4) Install new filter-drier (para 5-15).
- (5) Leak-test as directed in paragraph 5-5.
- (6) Reinstall the pressure switch housing using screws (1).
- (7) Replace the components removed in the preliminary requirements items 3 and 4.
- (8) Test, evacuate and recharge system as per paragraph 5-5 thru 5-8.
- (9) Remove gauges, and replace caps on service valves.
- (10) Replace fresh air screen as per paragraph 4-14.

## 7. PRESSURE REGULATING VALVE.

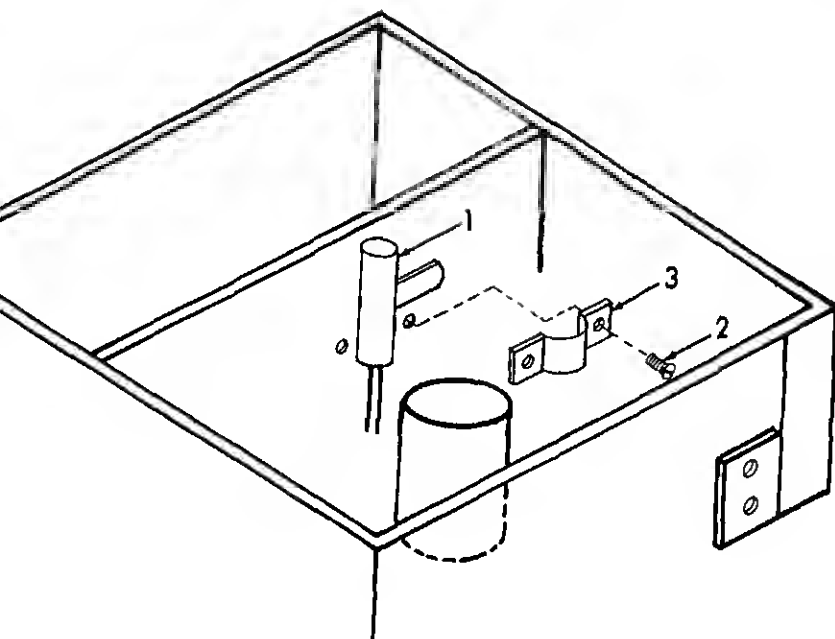
### Description.

The pressure regulating valve is functionally a part of the low pressure circuit, and opens when suction pressure drops below a preset level. When the valve opens, it bypasses refrigerant gas to the high pressure side of the compressor to prevent the formation of low suction pressures. If pressure testing indicates that the suction pressure is below limits, adjustment of the pressure regulating valve will usually correct the trouble. The pressure regulating valve is located at the top of the air conditioner, in front of the pressure equalizing and liquid quench expansion valves.

### Preliminary Requirements.

#### ADJUSTMENT

- (1) Remove canvas cover (para 4-8).
- (2) Remove top panel (para 4-9).
- (3) Remove fresh air screen (para 4-14).
- (4) Remove condenser fan guard (para 4-16).
- (5) Remove condenser fan (para 4-44.2).



Test.

Inspect the pressure regulating valve for physical or proper operation of the valve by pressure testing in accordance with paragraph 5-8. If minimum suction is outside of limits, adjust the pressure regulating valve.

Adjust the valve by removing the knurled screw-cap from the pressure regulating valve, and adjusting the internal screw on the suction line gauge. Turning adjustment clockwise increases pressure. When the gauge indicates the proper pressure, replace the knurled screw-cap snugly on the valve.

## WARNING

Refrigerant gas must be discharged from the system before removing the valve. Refer to paragraph 5-9 for discharge of system.

Connect a cylinder of dry nitrogen (item 8, table E-1) to the discharge service valve, and initiate a 1-2 cfm (0.1 - 0.2 M<sup>3</sup>/min) flow through the system.

Braze the two tubing joints at the pressure regulating valve, (1) (para 5-4).

Remove screws (2) and bracket (3).

Remove pressure regulating valve (1).

## Installation.

- (1) Connect tubing ends to the valve, and braze in place. Wrap valve in wet cloths to act as a heat sink.
- (2) Install pressure regulating valve (1), bracket (3), and screws (2).
- (3) Install new filter-drier (para 5-15).
- (4) Leak-test as instructed in paragraph 5-5.
- (5) Replace the components removed in the preliminary requirements.
- (6) Test, evacuate, and recharge system as per paragraph 5-5 through 5-8.
- (7) Remove gauges, and replace caps on service valves.
- (8) Replace fresh air screen as per paragraph 4-14.
- (9) Install condenser fan (para 4-44.2).
- (10) Install condenser fan guard (para 4-16)

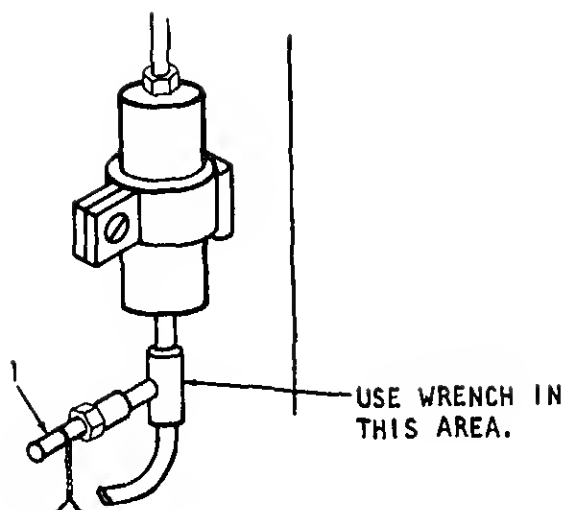
## 5. PRESSURE RELIEF VALVE.

### Description.

The pressure relief valve is a conventional spring-loaded relief valve, located on a tee fitting just below the filter-drier. The relief valve is preset at  $540 \pm 54$  psi ( $38 \pm 3.8$  kg/cm<sup>2</sup>). The valve is equipped with 1/4 inch by 18 NPTF Dryseal pipe threads so that it can be screwed into the tee.

### Preliminary Requirements.

- (1) Remove lower panel (para 4-12).
- (2) Remove fresh air screen (para 4-14).
- (3) Remove junction box (para 4-28).
- (4) Discharge system (para 5-3).



a1.

all refrigerant gas has been discharged from the system, and remove the pressure relief valve (1). Use a back-up wrench to prevent damage to refrigeration system tubing.

Installation.

- (1) Wrap Teflon pipe tape around the threads of the replacement pressure relief valve, and screw the valve into the tee. Use a backup wrench on the tee to prevent damage when tightening the valve.
- (2) Replace the filter-drier (para 5-15).
- (3) Leak test as per paragraph 5-5.
- (4) Replace the components removed in the preliminary requirements.
- (5) Test, evacuate, and recharge system as per paragraph 5-5 thru 5-8.
- (6) Remove gauges and replace caps on service valves.
- (7) Replace fresh air screen as per paragraph 4-14.
- (8) Install junction box (para 4-28).
- (9) Install lower panel (para 4-12).

## 19. SERVICE VALVES.

### Description.

Access to the internal refrigeration system is provided by two system service valves, located just inside the fresh air screen. The valves are connection points for pressure and vacuum gauges, nitrogen for purging and leak-testing, and for charging refrigerant to the system.

### Preliminary Requirements.

#### TESTING

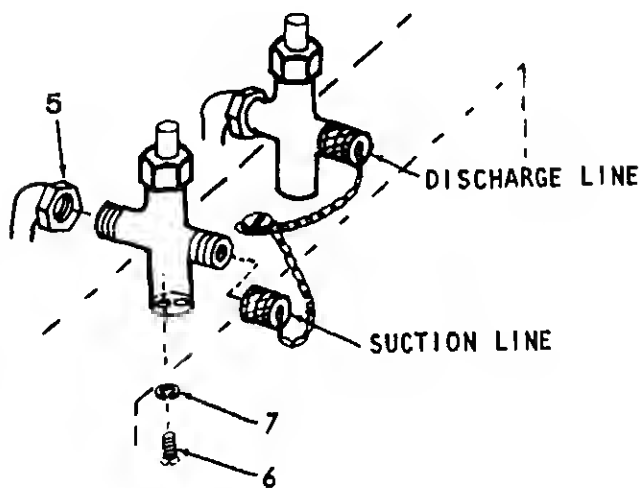
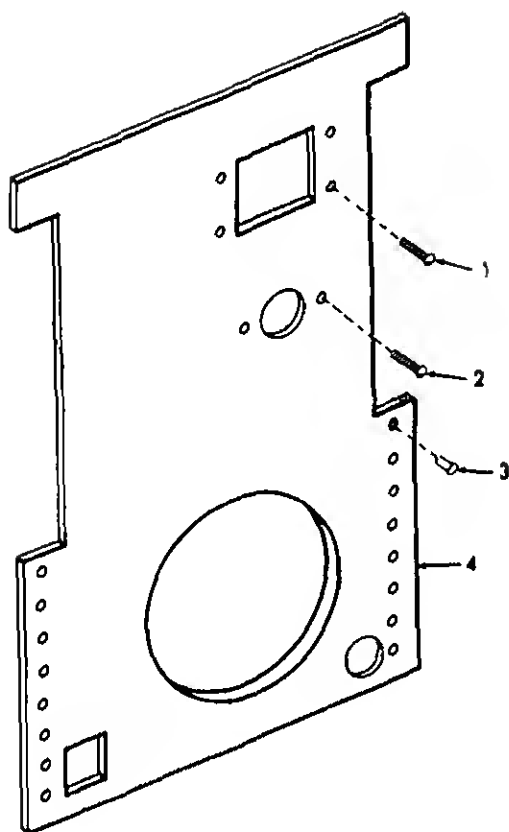
Remove fresh air screen (para 4-14).

#### REPLACEMENT

- (1) Discharge system (para 5-3).
- (2) Remove condenser fan guard (para 4-16).
- (3) Remove condenser fan (para 4-44.2).
- (4) Remove motor support (para 4-17).
- (5) Remove CBR cover (para 4-13).
- (6) Remove canvas cover (para 4-8).
- (7) Remove top panel (para 4-9).
- (8) Remove condenser coil guard (para 4-15).

### Inspection/Test.

Visually inspect the service valves for physical damage, broken flares and missing caps. Replace missing or broken parts or damaged valves. Test for leaks, both with caps snugly screwed on and with caps off, in accordance with paragraph 5-5. If leaks are detected with caps off, the valves are faulty. If leaks are detected with caps on, the flare nut connections are probably faulty.



## Removal.

- (1) Remove screws (1) that attach pressure cut-out switch to panel.
- (2) Remove screws (2) that attach sight glass to panel.
- (3) Drill out rivets (3).
- (4) Pry side of case outward so that panel (4) can be removed.

## WARNING

Make sure that all refrigerant gas has been discharged from the system before proceeding (para 5-3).

- (5) The inner end of each service valve is connected to refrigeration piping with a flare nut (5). Disconnect by unscrewing the flare nut.
- (6) Remove two screws (6) and lock washers (7) that attach valve body to the floor of the fresh air intake chamber.

## Installation.

- (1) Screw the flare nut (5) onto the connecting end of the service valve tight.
- (2) Install two screws (6) and lockwashers (7) in each valve body through the floor of the fresh air chamber as shown below.
- (3) Tighten the flare nuts (5).
- (4) Replace panel (4) using rivets (3).
- (5) Replace sight glass screws (2).
- (6) Replace pressure cut-out switch screws (1).
- (7) Replace condenser fan (para 4-44.2).
- (8) Replace condenser fan guard (para 4-16).
- (9) Replace CBR panel (para 4-13).
- (10) Replace top panel (para 4-9).
- (11) Replace canvas cover (para 4-8).
- (12) Replace the filter-drier (para 5-15).

- ) Replace the components removed in the preliminary requirements.
- ) Test, evacuate, and recharge the system as per paragraph 5-5 thru 5-8.
- ) Remove gauges and replace caps on service valves.
- ) Replace fresh air screen (para 4-14).

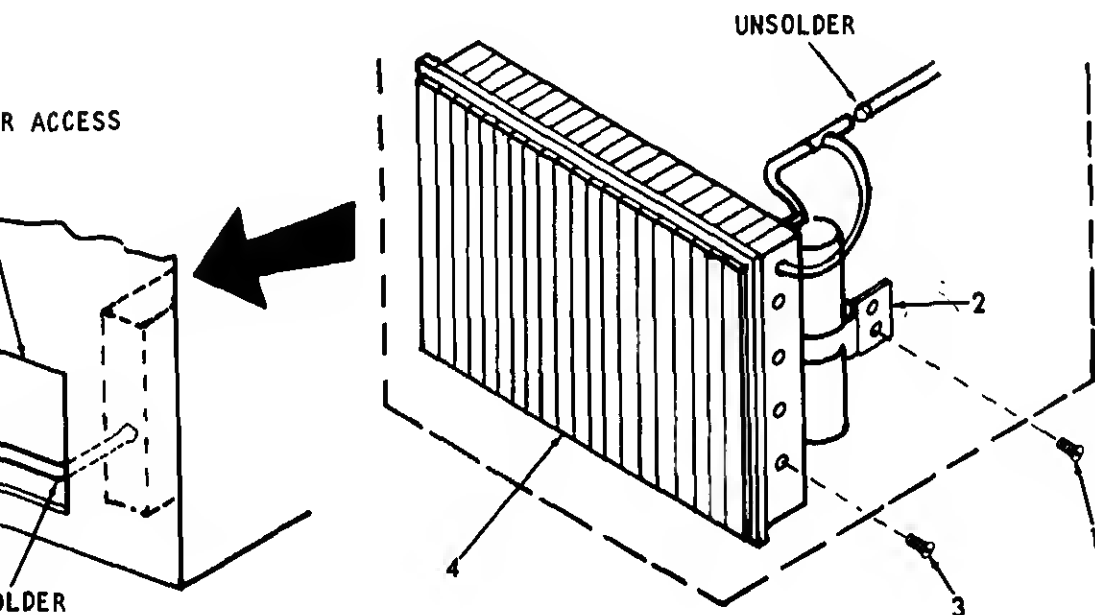
#### CONDENSER COIL REPLACEMENT.

tion.

Condenser coil assembly consists of two coils with a common; the condenser coil itself, and the subcooler coil. The coil assembly is located at the bottom rear section of the unit, and is covered by a grille and screen assembly to protect from damage or dirt.

#### Preliminary Requirements.

- ) Discharge system (para 5-3).
- ) Remove canvas cover (para 4-8).
- ) Remove condenser coil guard (para 4-15).
- ) Remove RFI filter (para 4-39).
- ) Debrazing (para 5-4).





## Removal.

- (1) Remove the screws (1) which secure the receiver bra to the side of the air conditioner
- (2) Remove four screws (3) in a vertical line on each s of the casing. These screws secure the condenser c (4) to the casing.
- (3) Provide a 1-2 cfm ( $0.1 - 0.2 \text{ M}^3/\text{min}$ ) flow of dry nitrogen (item 8, table E-1) through the system at discharge service valve. After three minutes of ni gen purging, debraze the tubing as shown in this fi It is not necessary to debraze the receiver at this Withdraw the condenser coil from the air conditione

## Servicing.

- (1) Cleaning

Cap or plug all openings, and tape caps or plugs to prevent accidental removal. No water must be permi to enter the coil. When thoroughly sealed, immerse coil in a warm detergent solution for five minutes soak loose caked-on dirt, then agitate the coil viglly in the solution to remove dirt from between the fins. Rinse thoroughly in clear water.

- (2) Fin Alignment

If fins are bent or crushed, straighten them with a or plastic blade so that they are straight and para Badly bent or crushed fins can cause serious distor of airflow, resulting in inefficient operation of t air conditioner.

## Installation.

### NOTE

If the receiver was removed, or a new coil is being installed, install the receiver to the coil assembly and braze joints before installing the coil in the air conditioner.

- (1) Position the condenser coil (4) in the air conditio with all tubing joints meeting properly. Secure th coil with four screws (3) through each side of the casing.
- (2) Start a flow of 1-2 cfm ( $0.1 - 0.2 \text{ M}^3/\text{min}$ ) of dry nitrogen (item 8, table E-1) through the system at discharge service valve. After three minutes of ni gen purging, braze joints.

- ) Install the receiver bracket (2) using screw (1) to the side of the air conditioner.
- ) Install a new filter-drier (para 5-15).
- ) Replace the components removed in preliminary requirements items 4 thru 2.
- ) Test, evacuate, and recharge system as per paragraphs 5-5 thru 5-8.

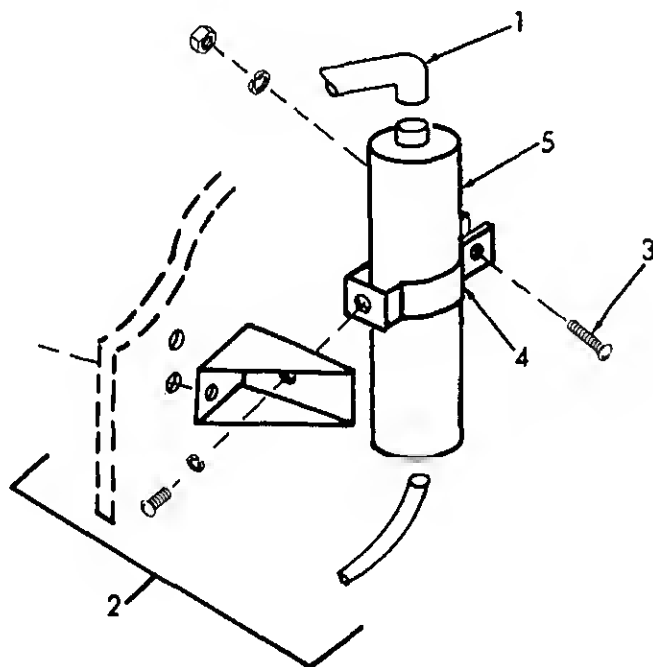
IVER.

tion.

ceiver is a small cylindrical tank in the line between the oil and the sub-cooler section of the condenser coil. Its to act as a reservoir for liquid refrigerant, which tends e operation of the refrigeration system. The receiver is the left side of the air conditioner, just in front of the oil.

nary Requirements.

- ) Remove condenser coil (para 5-20).
- ) Debrazing (para 5-4).



- ) With a flow of dry nitrogen (item 8, table E-1) connected to the condenser coil, debraze the tubing connections from the receiver, starting with the top connection

- (2) Withdraw the receiver, band clamp (4) and support by a unit (2).
- (3) Loosen the clamping screw (3) in the band clamp (4) slide the clamp from the receiver (5).

#### Installation.

- (1) Place the receiver (5) in the band clamp (4), and tighten the clamping screw (3) finger tight.
- (2) Make tubing connections (1) from the condenser coil to the receiver, and tighten the clamping screw (3) in band clamp (4).
- (3) Restart the flow of dry nitrogen (item 8, table E-1) braze tubing joints to the receiver.
- (4) Reinstall condenser coil (para 5-20).

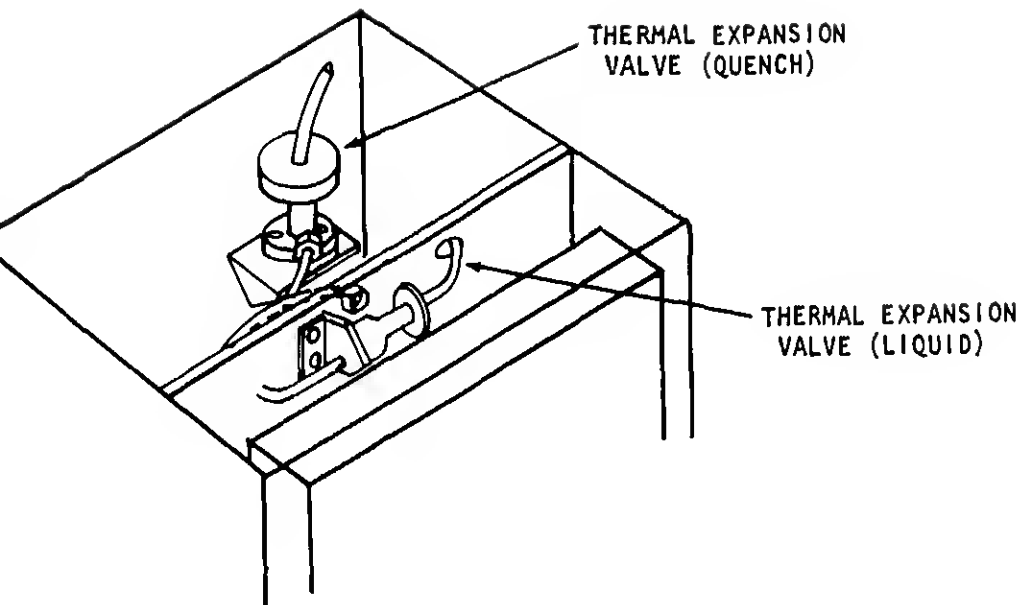
#### 5. THERMAL EXPANSION VALVE.

##### Description.

Two thermal expansion valves are used in the air conditioner expansion valve meters (liquid) refrigerant into the evaporator, through a distributor which disperses the liquid refrigerant into several parts of the coil. The other expansion valve (quench) injects liquid refrigerant into the compressor suction line to reduce the temperature of hot gas in the bypass circuit. Both valves respond to temperature changes in the refrigerant suction line to which the sensing bulbs are attached. The effects of pressure-drop across the evaporator coil are cancelled by a pressure equalization line from the thermal expansion valve to the downstream (suction) end of the evaporator coil just beyond the sensing bulb. This pressure equalization permits the valve to respond more quickly to temperature changes alone. Since pressure-drop in the liquid circuit is insignificant, the liquid injection expansion valve is equalized to the suction pressure. Both valves are hermetically sealed to their sensing lines and capillary tubes.

##### Preliminary Requirements.

- (1) Remove canvas cover (para 4-8).
- (2) Remove top panel (para 4-9).
- (3) Remove condenser fan guard (para 4-16).
- (4) Remove condenser fan (para 4-44.2).



g.

- 1) Cut insulation away from sensing bulb and band clamps. Remove screw from band clamps, and remove sensing bulb.

#### NOTE

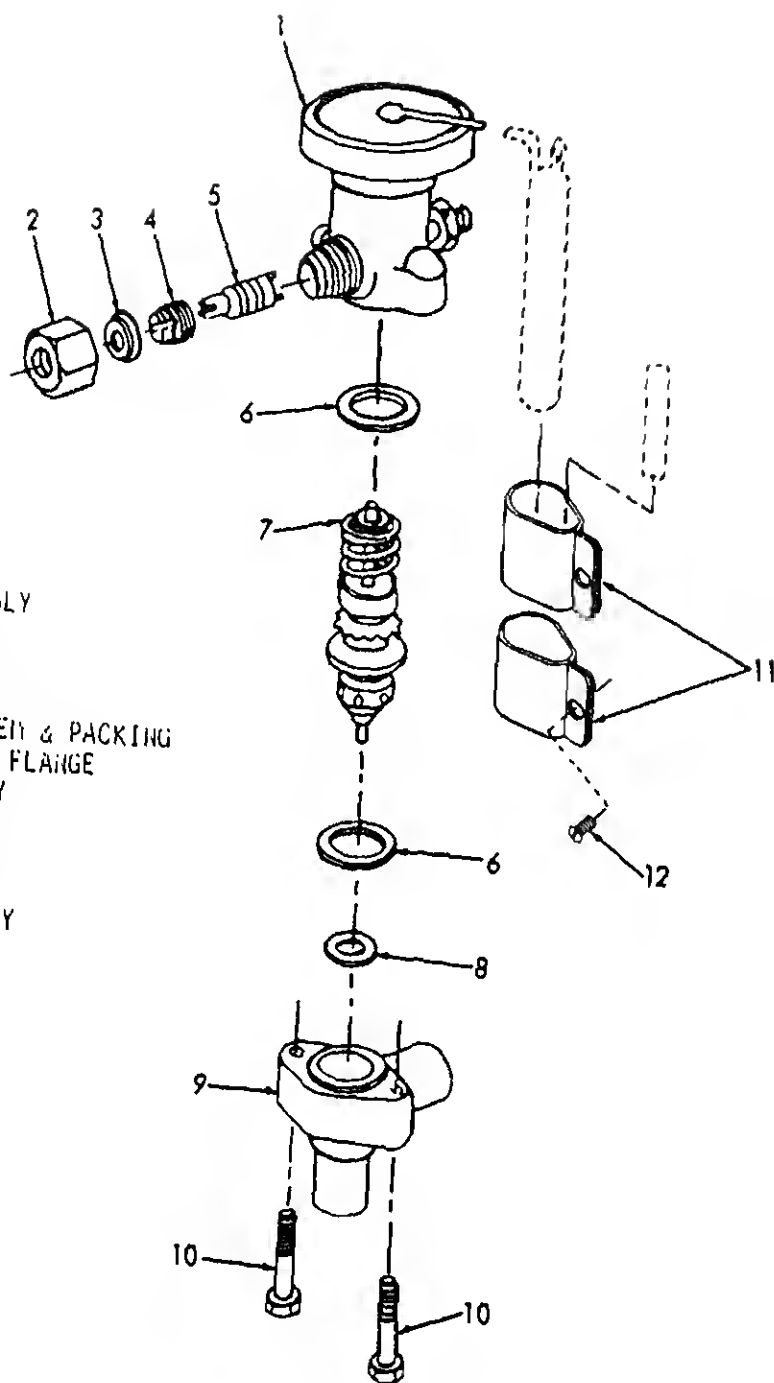
Because the condenser fan impeller and the top panel were removed for access, the condenser coil will be without airflow. Provide temporary airflow for the following test, by placing a high velocity fan or centrifugal blower directly in front of the condenser coil, and as close to it as possible.

- 2) With the air conditioner stopped, let the suction line warm up to ambient temperature.
- 3) Remove the sensing bulb from its location against the suction line, and place it in a container of ice water or crushed ice (32°F or 0°C). Note position of bulb on removal and be sure to replace it in the same position.

#### CAUTION

Do not let liquid refrigerant flood back into the compressor any longer than 1-2 seconds. The expansion valve will be wide open during the following procedure. Excessive flood-back of liquid refrigerant will damage the compressor.

POWER ASSEMBLY  
CAP, SEAL  
BOUINET SEAL  
PACKING SEAL  
ADJUSTING STEIN & PACKING  
GASKET, BODY FLANGE  
CAGE ASSEMBLY  
GASKET, SEAT  
FLANGE, BODY  
SCREWS, CAP  
CLAMP ASSEMBLY  
SCREW



4) Start the air conditioner by setting the rotary selector switch at COOL, and the temperature control thermostat at maximum DECREASE. Remove the sensing bulb from the ice water, and hold it in one hand to warm it while feeling the suction line. If the suction line temperature drops, the valve is operating properly. Stop the air conditioner at once, and re-install the sensing bulb. If the temperature of the suction line does not drop, stop the air conditioner and replace the expansion valve.

ing Superheat.

Refrigerant gas is said to be superheated when its temperature is higher than the evaporating temperature corresponding to its pressure. When a thermal expansion valve is set for optimum (in this case 6°F or 3.3°C above the evaporating temperature of the refrigerant at a given pressure) the evaporator coil operates at maximum efficiency. That is, the refrigerant gas does not condense before reaching the end of the coil, which would reduce cooling capacity, and the refrigerant does not remain in liquid state after passing completely through the coil, which would result in severe damage to the compressor. The superheat setting of a thermal expansion valve can be adjusted by varying the set-spring (7) in the power assembly of the valve. The spring tends to hold the valve closed against the pressure in the suction line and capillary tube; therefore, the greater the spring tension, the higher the superheat. Check superheat, and adjust if necessary in accordance with the following procedure:

Remove insulation from a spot on the suction line near the sensing bulb of the thermal expansion valve to be adjusted.

Install an accurate thermometer or the probe of a thermocouple on the bare spot, using a small gob of thermal mastic, if necessary, to improve conductivity. Tape the thermometer bulb or thermocouple junction in position, and cover with insulating material.

Connect a suitable pressure gauge to the suction service line and open the valve.

Operate the air conditioner in the cooling mode for about 30 minutes, observing the thermometer or thermocouple dial to see that the temperature has stabilized. When the temperature remains unchanged for at least two minutes, record the temperature and pressure.

Compare the recorded temperature and pressure with those in Table 1. Each expansion valve should register higher than the values in the Table by the following amount.

Evaporator expansion valve:  $6^{\circ} \pm 1.5^{\circ}\text{F}$  or  $3.3^{\circ} \pm 0.8^{\circ}\text{C}$ .

Quench expansion valve:  $30.4^{\circ} \pm 0.5^{\circ}\text{F}$  or  $16.7^{\circ} \pm 0.3^{\circ}\text{C}$ .

Table 5-3. Pressure - Temperature Relationship of Saturated Refrigerant

Temperature		Pressure		Temperature		
Deg F	Deg C	Psig	kg/cm <sup>2</sup>	Deg F	Deg C	Psi
10	-12.3	32.93	2.315	66	18.9	114.
12	-11.1	34.68	2.439	68	20.0	118.
14	-10.0	36.89	2.593			
16	- 8.9	38.96	2.739	70	21.1	122.
18	- 7.8	41.09	2.889	72	22.2	126.
				74	23.3	131.
20	- 6.6	43.28	3.043	76	24.4	135.
22	- 5.5	45.23	3.180	78	25.6	140.
24	- 4.3	47.85	3.364			
26	- 3.4	50.24	3.532	80	26.7	145.
28	- 2.2	52.70	3.705	82	27.8	149.
				84	28.9	154.
30	- 1.1	55.23	3.883	86	30.0	159.
32	0	57.83	4.066	88	31.1	164.
34	1.1	60.51	4.254			
36	2.2	63.27	4.448	90	32.2	170.
38	3.3	66.11	4.648	92	33.3	175.
				94	34.5	180.
40	4.4	69.02	4.853	96	35.6	186.
42	5.5	71.99	5.062	98	36.7	192.
44	6.6	75.04	5.276			
46	7.7	78.18	5.497	100	37.8	197.
48	8.8	81.40	5.723	102	38.9	203.
				104	40.0	209.
50	10.0	84.70	5.955	106	41.1	216.
52	11.1	88.10	6.257	108	42.2	222.
54	12.2	91.5	6.433			
56	13.3	95.1	6.686	110	43.3	228.
58	14.5	98.8	6.947	112	44.4	235.
				114	45.6	241.
60	15.6	102.5	7.206	116	46.7	248.
62	16.7	106.3	7.474	118	47.8	255.
64	17.8	110.2	7.748			

(6) If the superheat setting is not within the limits above (higher than the values in Table 5-3), adjust the expansion valve as follows:

(a) Remove the hexagonal seal cap (2) from the side power assembly (1), and loosen the bonnet seal (3).

(b) Turn the adjusting stem (5) two complete turns to superheat of one degree F. Turn clockwise to raise, and counter clockwise to lower, the superheat setting. Do not turn more than two turns, then wait ten minutes for temperature to stabilize before observing temperature and pressure readings.

) When the proper setting is obtained, replace the screw on the valve adjusting stem (5).

Remove the thermometer or thermocouple probe from the line, and replace the insulating material. Close the suction valve, remove the pressure gauge, and install the cap on the valve gauge port.

al.

- (1) Discharge system (para 5-3).
- (2) Remove insulation and band clamp from sensing bulb. Carefully detach bulb and capillary tube.
- (3) Remove two capscrews (10) securing the power assembly (1) to the valve body (9). Remove the power assembly, capillary tube and sensing bulb.
- (4) Detach equalizer line, on liquid expansion valve. Not applicable to quench valve.

**CAUTION**

Maintain a 1-2 cfm ( $0.1 - 0.2 \text{ M}^3/\text{min}$ ) flow of dry nitrogen (item 8, table E-1) through the refrigeration system to prevent oxidation and scaling when brazing or debrazing components.

- (5) Debrazed (para 5-4).
- (6) Remove valve body (9).

Installation.

- (1) Disassemble the new valve by removing two capscrews (1) that secure the power assembly (1) to the valve body (9), and separate the two.
- (2) With dry nitrogen (item 8, table E-1) flowing through the refrigeration system braze tubing joints. Let cool. Tighten capscrew.
- (3) Install the valve body in the support bracket, and secure with two capscrews (10), finger tight. Connect tubing.
- (4) Install power assembly (1) on valve body, being careful to fit lugs on the cage assembly (7) into the cavities in the body (9). Secure with two capscrews (10). Connect equalizer line, on liquid expansion valve. Not applicable to quench valve.



- (5) Wrap the capillary tube with a double thickness of insulating tape (item 6, table E-1), being careful to avoid kinking the tube.
- (6) Carefully lead the sensing tube to its position on the suction line. Clamp in position to the suction line. Cover suction line, sensing bulb and clamp with insulating material.
- (7) Carefully form the capillary tube along adjacent wall and tape to support.
- (8) Leak-test in accordance with paragraph 5-5.
- (9) Replace filter-drier (para 5-15).
- (10) Test, evacuate, and recharge system as per paragraph 5-5 thru 5-8.
- (11) Reinstall components removed in the preliminary requirements.
- (12) Remove gauges and replace caps on service valves.
- (13) Replace fresh air screen (para 4-14).

## 23. EVAPORATOR COIL REPLACEMENT.

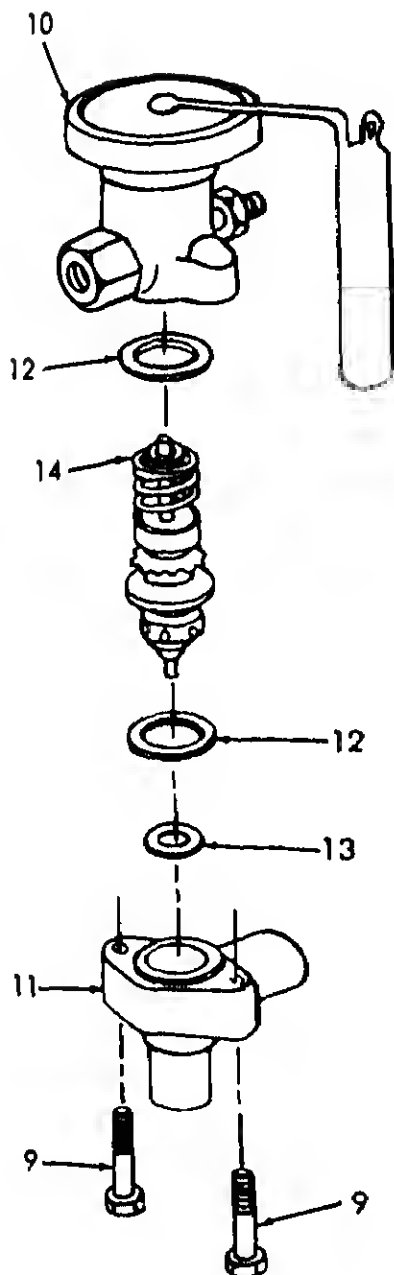
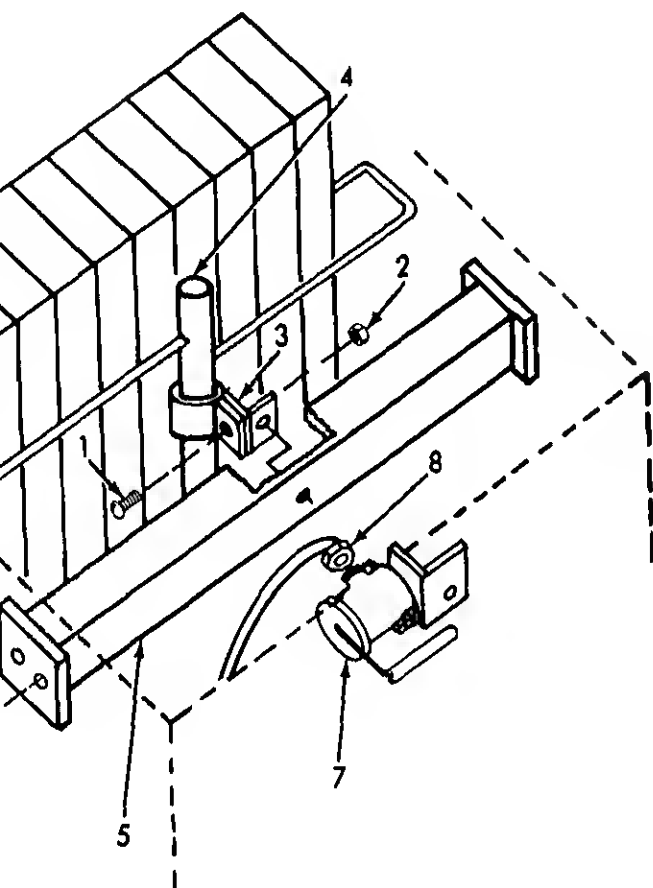
### Description.

The evaporator coil receives liquid refrigerant from the expansion valve, and evaporates the liquid to a gas by absorbing heat from the airflow passing over the outside surface of the coil. The evaporator coil is located in the top front section of the air conditioner.

### Preliminary Requirements.

- (1) Remove canvas cover (para 4-8).
- (2) Remove top panel (para 4-9).
- (3) Remove air discharge grille (para 4-10).
- (4) Remove mist eliminator (para 4-20).
- (5) Remove heating elements (para 4-43.1).
- (6) Remove condenser fan guard (para 4-16).
- (7) Remove condenser fan (para 4-44.2).
- (8) Remove air intake grille (para 4-11).
- (9) Remove air intake filter (para 4-18).

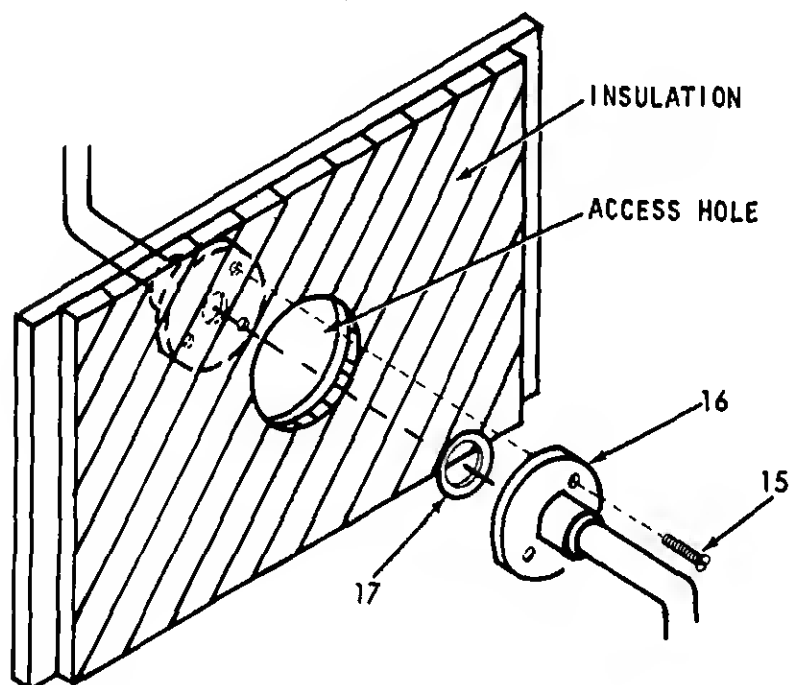
- 0) Remove evaporator fan (para 4-44.1).
- 1) Discharge system (para 5-3).
- 2) Debraze (para 5-4).



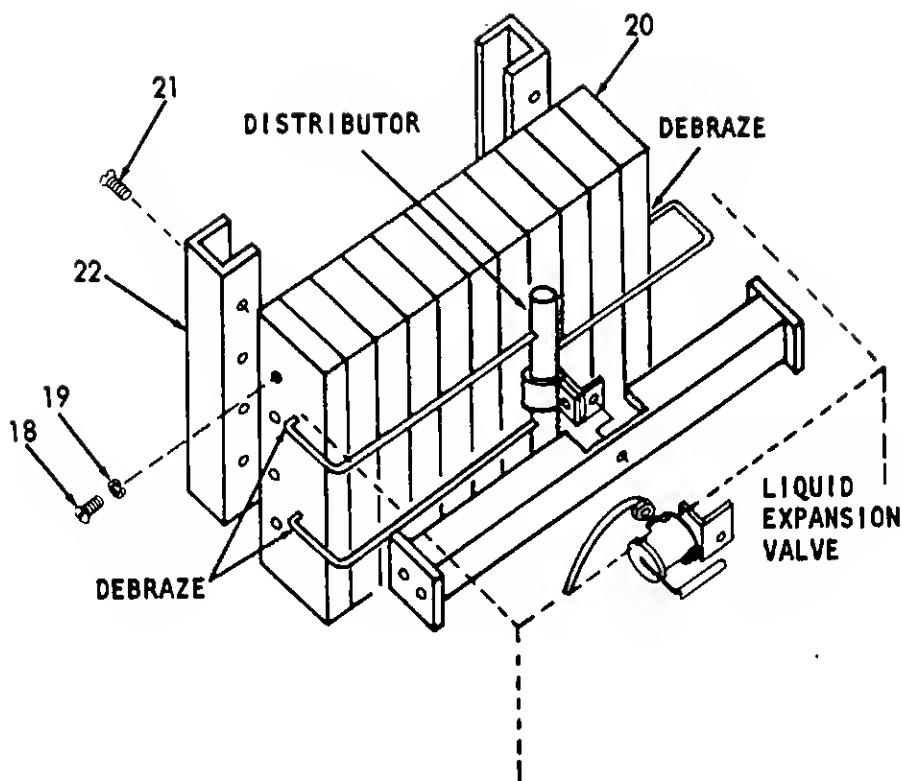
al.

- (1) Remove screw (1) and nut (2) that attaches clamp (3) pipe (4).
- (2) Remove heater mounting bracket (5) by drilling out rivets (6).

- (3) Dismantle the liquid line expansion valve (7) as detailed below, but do not debraze the distributor from the valve body at this time.
  - (a) Unscrew the equalizer tube flare nut (8) from the power assembly of the valve.
  - (b) Remove two mounting screws (9), from the bracket and valve body. Carefully separate the power assembly (10) from the valve body (11), and remove gaskets (12 and 13) and cage assembly (14).
  - (c) Provide a flow of 1-2 cfm (0.1 - 0.2 M<sup>3</sup>/min) of dry nitrogen (item 8, table E-1) through the valve from the discharge service valve for at least 5 minutes, then debraze the liquid line from the expansion valve.
- (4) Remove condenser fan baffle if required (see page 14).
- (5) Accessing through the condenser fan, remove insulation around flange.
- (6) Remove three capscrews (15) from the rear of the suction line flange connection (16) and separate the two halves of the flange connection slightly. Remove and discard the O-ring (17).



- (7) Remove the four screws (18) and packing washers from the casing and evaporator coil bracket on the rear of the air conditioner. Lift the coil (20) straight out and remove it from the air conditioner.



servicing.

## 1) Cleaning

Cap or plug all openings, and tape caps or plugs to prevent accidental removal. No water must be permitted to enter coil. When thoroughly sealed, immerse the coil in warm detergent solution for five minutes to soak loose caked-on dirt, then agitate the coil vigorously in the solution to remove dirt from between the fins. Rinse thoroughly in clear water.

## 2) Fin Alignment

If fins are bent or crushed, straighten them with a wood block and plastic blade so that they are straight and parallel. Bent or crushed fins can cause serious distortion of air flow, resulting in inefficient operation of the air conditioner.

Reassembly.

If a new coil is to be installed, debraze the distributor assembly from the old coil at three places. Remove mist eliminator retainer channels (22) from the coil by removing four screws (21) from each channel.

Installation.

- (1) Position the mist eliminator channels (22) on the top of the evaporator coil, at each end, and secure with four screws (21) through each channel.

- (2) Provide a flow of 1-2 cfm (0.1 - 0.2 M<sup>3</sup>/min) of dry nitrogen (item 8, table E-1) through the system for at least three minutes.
- (3) Braze the distributor assembly on the new evaporator coil.
- (4) Place evaporator coil (20) in position.
- (5) Install a new O-ring (17) in the groove of the suction line connecting flange (16) and assemble the halves of the flange. Secure with three capscrews (15) from the back of the partition. Replace insulation.

#### NOTE

If a new liquid line expansion valve body is to be installed, braze the distributor body into the discharge port of the expansion valve before assembling the valve.

- (6) Position the liquid line expansion valve body (11) on its support bracket, and align by securing with two screws (9) and slave nuts. Do not install power assembly at this time. Braze liquid line to valve body.
- (7) Install new gaskets (12) and seat (13) in valve body.
- (8) Place cage assembly (14) in power assembly (10), remove screws (9) and fit bosses of cage assembly into recess in valve body. Secure power assembly (10) to valve body (11) with screws (9). Connect the equalizer line flange nut.
- (9) Install screws (18) and washers (19) that secure evaporator coil (20) to air conditioner.
- (10) Install evaporator fan (para 4-44.1).
- (11) Install condenser fan (para 4-44.2).
- (12) Install air intake filter (para 4-18).
- (13) Install air intake grille (para 4-11).
- (14) Install heater mounting bracket (5) using rivets (6).
- (15) Install clamp (3) to pipe (4) using screw (1) and nut (2).
- (16) Install heating elements (para 4-43.1).
- (17) Install a new filter-drier (para 5-15).

- (18) Purge the refrigeration system with dry nitrogen (item 8, table E-1) at 1-2 cfm ( $0.1 - 0.2 \text{ M}^3/\text{min}$ ) for 15 minutes.
- (19) Test, evacuate, and recharge as per paragraphs 5-5 thru 5-8.
- (20) Install the mist eliminator by sliding it straight down in the channels in front of the evaporator coil. Make sure that TOP mark is up, and that airflow arrows point outward (refer to para 4-20).
- (21) Replace components removed in preliminary requirements items 3, 2, 1.



## CHAPTER 6

## GENERAL SUPPORT MAINTENANCE

## Section I. GENERAL

ERAL.

This chapter is for the use of general support maintenance personnel. This chapter contains maintenance procedures for the casing

## Section II. MAINTENANCE PROCEDURES

ING ASSEMBLY.

ption.

The casing assembly supports or surrounds all functional components of the air conditioner. Therefore, if damage is extensive enough to require replacement of the casing assembly, it is also enough to have caused significant damage to major components. In this case it is necessary to procure a new casing assembly, and to replace the damaged unit completely, test all components, and replace unserviceable components in the new casing. Unserviceable components must be replaced.

ction.

Inspect the casing assembly for dents, gouges, cuts or tears, and corrosion. Remove panels as necessary to determine whether components such as coils, wiring, piping or other components and systems have been damaged. If damage is apparent, leak-test the refrigeration system and make an operating check of the unit and functional components. If the unit is functionally OK, repair the casing.

r.

Lighten dents by using a sheet-metal hammer and back-up dolly to avoid stretching the metal more than necessary. Fill with body putty, fiberglass-epoxy filler, or weld. Weld cuts if possible, or fabricate a patch and attach it with blind rivets. Sand paint to a feather edge around the repair, and paint as in TM 43-0139.



### 6-3. INSULATION.

#### a. Description.

Insulation consists of sheets of foam plastic or foam rubber attached with adhesive.

#### b. Inspection.

Inspect insulation for areas of looseness or separation from metal panel, and for missing areas. Replace damaged or missing insulation.

#### c. Removal.

### WARNING

Acetone (item 1, table E-1) and methyl-ethyl ketone (MEK) (item 7, table E-1) are flammable, and their vapors are explosive. Prolonged or repeated inhalation of fumes or contact with the skin can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

Scrape or pull off as much of the damaged insulation as possible. Soften the remaining insulation and adhesive with acetone or MEK (item 1 or 7, table E-1) and remove with a putty knife, paint scraper, or similar tool. Repeat the softening and scraping process as required, then clean up the metal surface with a cloth moistened with acetone or MEK.

#### d. Installation.

Cut a sheet of the proper insulating material to the correct shape, and coat the attaching side with adhesive (item 2, table E-1) using a brush to ensure complete coverage. Also, brush adhesive on the metal to which the insulation is to be attached. Let both surfaces air-dry until the adhesive becomes tacky but will not stick to the fingers. Starting at one corner or at a narrow edge, carefully bring the insulation into full contact with the metal. Press into firm contact all over.

## REFERENCES

## FIRE PROTECTION

5-4200-200-10 Hand Portable Fire Extinguishers  
for Army Users.

## PAINTING

43-0139 Painting Instructions for Field  
Use.

## MAINTENANCE

38-750 Army Equipment Record Procedures.  
5-764 Electric Motor and Generator  
Repair.  
5-4120-344-24P Organizational, Direct Support and  
General Support Maintenance,  
Repair Parts and Special Tools  
List.

## EQUIPMENT AND STORAGE

740-90-1 Administrative Storage of Equip-  
ment.

## DESTRUCTION OF ARMY EQUIPMENT

750-244-3 Procedures for Destruction of Equip-  
ment to Prevent Enemy Use.



appendix lists components of end item and basic issue items for conditioner to help you inventory items required for safe operation.

RAL.

Components of End Item and Basic Issue Items Lists are to the following sections:

Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition items. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is transferred between property accounts. Illustrations are provided to assist you in identifying the items.

Section III. Basic Issue Items. These are the minimum items required to place the air conditioner in operation, to maintain it, and to perform emergency repairs. Although shipped separately, packaged BII must be with the air conditioner during transportation and whenever it is transferred between property accounts. Illustrations will assist you with hard-to-identify items. This listing is your authority to request/requisition replacement BII, based on the authorization of the end item.

EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the listings:

Column (1) - Illustration Number (Illus Number). This indicates the number of the illustration in which the item is illustrated.

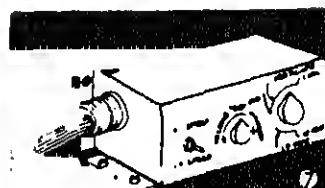
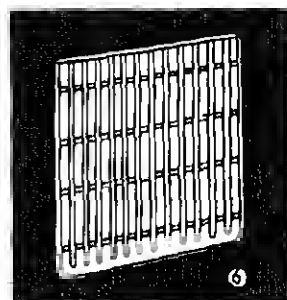
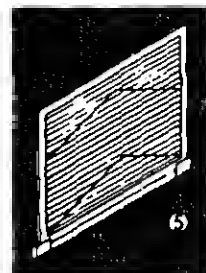
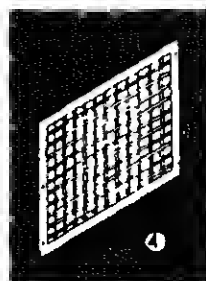
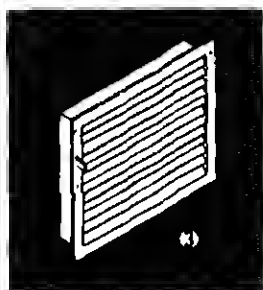
Column (2) - National Stock Number. Indicates the National Stock Number assigned to the item and will be used for requisitioning.

Column (3) - Description. Indicates the National item name required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure in performing the actual operation/maintenance function. The measure is expressed by a two-character alphabetical abbreviation (., ea, in, pr).

e. Column (5) - Quantity Required (Qty Rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

# Section II. COMPONENTS OF END ITEM



(1) S ER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION FSCM and PART NUMBER	(4) U/M
	4130-01-051-7425	Cover, Air Conditioner (97403) 13217E2346	EA
	5935-00-846-2328	Connector, Plug, Electrical (96906) MS3106R22-22S	EA
	4130-01-047-8362	Grille Assy, Intake (97403) 13215E9857	EA
	4120-01-054-6534	Grille Assy Discharge (97403) 13215E9857	EA
	4130-01-011-1217	Mist Eliminator (97403) 13219E2647	EA
		Guard, Condenser (97403) 13215E9867	EA
	4120-01-062-0698	Control Panel Assembly (97403) 13218E8492-1	EA

Section III. BASIC ISSUE ITEMS

NAL STOCK NUMBER	DESCRIPTION	QTY REQ
20-00-559-9618	Case, Manual	1

## APPENDIX C

## MAINTENANCE ALLOCATION CHART

## Section I. INTRODUCTION

General

This section provides a general explanation of all maintenance repair functions authorized at various maintenance levels.

Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component, work measurement time required to perform the functions by the assigned maintenance level. The implementation of the maintenance functions upon the end item or components will be consistent with the maintenance functions.

Section III lists the tools and test equipment required for each maintenance function as referenced from Section II (Not applicable).

## EXPLANATION OF COLUMNS IN SECTION II.

Column (1), Group Number. Column 1 lists group numbers to which related components, assemblies, subassemblies, and modules are assigned for next higher assembly. The applicable groups are listed in the maintenance sequence beginning with the first group.

Column (2), Component/Assembly. This column contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

Column (3), Maintenance Functions. This column lists the functions to be performed on the item listed in Column 2. The maintenance functions are defined as follows:

(1) Inspect. To determine serviceability of an item by measuring its physical, mechanical, or electrical characteristics with prescribed standards through, examination.

(2) Test. To verify serviceability and to detect in-service failure by measuring the mechanical or electrical characteristics of an item, and comparing those characteristics with prescribed standards.

(3) Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.



(4) Adjust. To maintain within prescribed limits, bring into proper or exact position, or by setting the operating characteristics to specified parameters.

(5) Align. To adjust specified variable elements of a system to bring about optimum or desired performance.

(6) Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consist of comparison of two instruments, one of which is a certified standard of known accuracy to detect and adjust any discrepancy in the accuracy of the instrument being compared.

(7) Install. The act of emplacing, seating, or fitting into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

(8) Replace. The act of substituting a serviceable type part, subassembly or module (component or assembly) for an unserviceable counterpart.

(9) Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) and other maintenance actions (welding, grinding, riveting, straightening, facing, remachining or resurfacing) to restore serviceability of an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and its system.

(10) Overhaul. That maintenance effort (service/actions necessary to restore an item to a completely serviceable/operating condition as prescribed by maintenance standards in appropriate technical manuals. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

(11) Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with organizational manufacturing standards. Rebuild is the highest degree of material maintenance applied to equipment. The rebuild operation includes the act of returning equipment to those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

d. Column (4), Maintenance Level. This column is made up of subcolumns for each category of maintenance. Work time figures are listed in these subcolumns for the lowest level of maintenance authorized to perform the function listed in Column 3. These figures indicate the average active time required to perform the maintenance function at the indicated category of maintenance under typical operating conditions.

Column (5), Tools and Equipment. This column is provided for listing by code, the common tool sets (not individual tools) and test and support equipment required to perform the maintenance functions (Not Applicable).

Column (6), Remarks. Not Applicable

### EXPLANATION OF COLUMNS IN SECTION III.

Column (1), Reference Code. The tool and test equipment code correlates with a maintenance function on the item, system or component.

Column (2), Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

Column (3), Nomenclature. Name or identification of the tool or test equipment.

Column (4), National/NATO Stock Number. The National or NATO stock number of the tool or test equipment.

Column (5), Tool Number. The manufacturer's part number.

# Section II. MAINTENANCE ALLOCATION CHART (TSARCOM Rev 310-6)

NOMENCLATURE OF END ITEMS

AIR CONDITIONER, 18,000 BTU/HR

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	N	O		
01	CASING AND RELATED PARTS								
	Canvas Cover	Inspect	0.1						
		Install	0.1						
		Replace		0.2					
	Top Panel Assembly	Replace		0.3					
	Gasket	Replace		1.3					
	Insulation	Replace		1.3					
	Air Discharge Grille	Inspect		0.1					
		Service		0.1					
		Replace		0.2					
		Repair		0.3					
	Gasket	Replace		1.3					
	Air Intake Grille	Inspect		0.1					
		Service		0.1					
		Replace		0.2					
	Gasket	Replace		1.3					
	Lower Panel	Replace		0.2					
		Repair		1.3					
	Gasket	Inspect		0.1					
		Replace		1.3					
	Insulation	Inspect		0.1					
		Replace		1.3					
	CBR Cover	Replace		0.1					
	Fresh Air Screen	Inspect		0.1					
		Service		0.2					
		Replace		0.2					
	Condenser Coil Guard	Inspect		0.1					
		Service		0.2					
		Replace		0.2					

\*Subcolumns are follows: C - Operator/Crew; O - Organizational  
F - Direct Support H - General Support D - Depot

\*\*Indicates WT/MH Required.

# Section II. MAINTENANCE ALLOCATION CHART

(Y3ARCOM R44 310-5)

NATURE OF END ITEMS

UP ER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(8) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	N	D		
1	CASING AND RELATED PARTS (continued)								
	Condenser Fan Guard	Inspect Service Replace		0.1 0.1 0.2					
	Motor Support	Replace		3.0					
	Air Filter	Inspect Service Replace		0.1 0.2 0.1					
	Fresh Air Damper Control	Inspect Adjust Replace Repair	0.1	0.1 0.5 1.0					
	Mist Eliminator	Inspect Service Replace		0.3 0.4 0.4					
	Block-off Panel	Install		0.5					
	Instruction Plates	Replace		1.0					
	Casing Assembly Insulation	Inspect Replace		0.1		8.0			
	Drip Pan Assembly	Inspect Service		0.1 0.3					
	Lower Drain Tube Assembly	Inspect Service Repair		0.1 0.3 0.4					
Columns are as follows:			C - Operator/Crew		O - Organizational				
F - Direct Support			H - General Support		D - Depot				
indicates WT/MH Required.									

Form 1568

Replaces 375 Form 1568-1, 1 Jul 76, which may be used.

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT
			C	O	F	N	D	
02	CONTROL PANEL AND JUNCTION BOX							
	Rotary Selector Switch	Test Replace		0.4 0.5				
	Temperature Con- trol and ther- mostat	Test Replace		0.4 0.5				
	Two Speed Fan Switch	Test Replace		0.4 0.5				
	Fuse Replacement	Test Replace		0.2 0.2				
	Circuit Breaker	Test Replace		0.4 0.5				
	Heater Motor Relay	Test Replace		0.4 0.5				
	Compressor Motor Relay	Test Replace		0.4 0.5				
	Time Delay Relay	Test Replace		0.4 0.5				
	Relay Armature	Test Replace		0.4 0.5				
	Transformer	Test Replace		0.4 0.5				
	Terminal Boards	Inspect Replace		0.4 0.5				
	Electrical Receptacles	Inspect Replace		0.5 1.0				
	*Subcolumns are as follows: F - Direct Support	C - Operator/Crew H - General Support			U D			Organizational Depot
	**Indicates WT/MH Required.							

CLASSIFICATION OF END ITEMS

(1) ITEM NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
	Rectifier Assy	Test Replace		0.4 0.5					
	RFI Filter Assembly	Test Replace		1.0 1.3					
	COMPRESSOR ASSEMBLY								
	Compressor	Test Replace		0.4	8.0				
	Compressor Crankcase Heater	Test Replace		0.4 0.5					
	PRESSURE SWITCHES								
	High and Low Pres- sure Cut-Out Switches	Test Replace		0.4	4.3				
	Pressure Control Switch	Test Replace		0.5	4.3				
	REFRIGERANT COMPONENTS								
	Refrigerant Tubing and Fittings	Inspect Test Replace			0.2 1.0 4.3				
	Solenoid Valves	Test Replace		0.4	4.3				
	Coil	Test Replace		0.4 0.5					
	Filter-drier (Dehydrator)	Replace			4.0				

Columns are as follows:  
 F - Direct Support

C - Operator/Crew  
 H - General Support

O - Organizational  
 D - Depot

Indicates WT/MH Required.

# Section II. MAINTENANCE ALLOCATION CHART

(TSARCOM R&amp;D 310-5)

NOMENCLATURE OF END ITEMS

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
05	REFRIGERANT COMPONENTS - continued								
	Sight-glass Liquid Indicator	Inspect Replace		0.1	5.0				
	Pressure Regulating Valve	Adjust Replace			2.0 4.3				
	Pressure Relief Valve	Replace			4.3				
	Service Valves	Inspect Replace			0.2 4.3				
	Receiver	Replace			4.5				
	Thermal Expansion Valves	Test Adjust Replace			2.0 2.0 4.5				
	Condenser Coil	Service Replace		1.3	8.0				
	Evaporator Coil	Service Replace		1.3	8.0				
	06	HEATER ASSEMBLY							
Electrical Heating Elements		Test Replace		1.5 2.0					
Heater Thermostatic Switch		Test Replace		0.5 1.0					
*Subcolumns are as follows:			C - Operator/Crew		O - Organizational				
F - Direct Support			H - General Support		D - Depot				
**Indicates WT/MH Required.									

Section II. MAINTENANCE ALLOCATION CHART  
(TSARCOM Ref 310-6)

URE OF END ITEMS

(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
		C	O	F	H	D		
FANS AND MOTORS								
Evaporator Fan Assembly	Inspect Replace		0.4 2.0					
Condenser Fan Assembly	Inspect Replace		0.4 2.0					
Fan Motor	Inspect Test Replace Repair		0.3 0.4 2.0 3.5					
WIRING HARNESS								
Wiring Harnesses	Inspect Test Replace Repair		0.4 0.5 1.3 1.5					
Wire Leads	Inspect Test Replace Repair		0.2 0.3 1.0 1.0					
Receptacle Connectors	Inspect Test Replace		0.2 0.3 1.3					
Plug Connectors	Inspect Test Replace		0.2 0.3 1.3					
Units are as follows: - Direct Support - WT/MH Required.	C - Operator/Crew H - General Support			O - Organizational D - Depot				

1568

Replaces STS Form 1568-1, 1 Jul 76, which may be used.



## Section III. TOOLS AND TEST EQUIPMENT

REFERENCE DE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
		No special tools and test equipment required. Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II.		
	F	Tool kit, service, refrigeration unit (SC 5180-90-CL-N18)	5180-00-597-1474	
	O	Soldering Gun Kit	3439-00-930-1638	

REFERENCE CODE	REMARKS
	NOT APPLICABLE



## APPENDIX D

### ADDITIONAL AUTHORIZATION LIST

---

#### Section I. INTRODUCTION

##### SCOPE.

This appendix list additional items you are authorized for t  
t of the air conditioner.

##### GENERAL.

This list identifies items that do not have to accompany, th  
nditioner and that do not have to be turned in with it. The  
are authorized to you by CTA, MTOE, TDA or JTA.

##### EXPLANATION OF LISTING

National stock number, description, and quantities are provi  
p you identify and request the additional items you require  
t this equipment. "Usable On " codes are identified as foll

CODE

USED ON

Not Applicable

#### Section II. ADDITIONAL AUTHORIZATION LIST

Not Applicable



# EXPENDABLE SUPPLIES AND MATERIALS LIST

## Section I. INTRODUCTION

COPE.

This appendix lists expendable supplies and materials you will operate and maintain the air conditioner.

These items are authorized to you by CTA 50-970, Expendable (except Medical, Class V, Repair Parts and Heraldic Items).

### EXPLANATION OF COLUMNS

Column 1, Item Number. This number is assigned to the item in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5,

Column 2, Level. This column identifies the lowest level of maintenance that requires the listed item.

- C - Operator/Crew
- O - Organizational Maintenance
- F - Direct Support Maintenance
- H - General Support Maintenance

Column 3, National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition

Column 4, Description. Indicates the Federal item name required, a description to identify the item. The last line of the item indicates the part number followed by the Federal Supply Code for Manufacturers (FSCM) in parenthesis, if applicable.

Column 5, Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is indicated by a two-character alphabetical abbreviation (e.g., ea, in the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

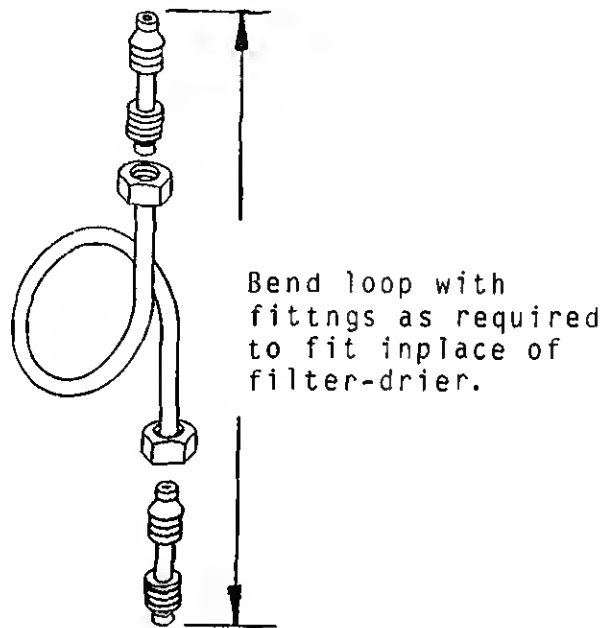
Table E-1. Expendable Supplies and Materials List

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION
1	H	8040-00- 664-4318	ACETONE
2	F,H		ADHESIVE Type MMM-A-1617 Type II
3	O,F		DRY CLEANING SOLUTION (PD- 680)
4	F	4130-00- 860-0042	FIBERGLASS CLOTH
5	F		FILTER-KOTE
6	F		INSULATING TAPE
7	H		METHYL-ETHYL-KETONE (MEK)
8	F		NITROGEN (Dry)
9	F		OIL (MIL SPEC U- 2104)
10	F		REFRIGERANT (R11)
11	F		REFRIGERANT (R22)
12	F		SOLDER (Spec QQ-S-571)

## MANUFACTURED ITEMS LIST

This appendix includes complete instructions for making authorized to be manufactured or fabricated at the direct support maintenance.

All bulk materials needed for manufacture of an item is part number or specification number on the illustration.



## Notes:

1. Dimensions in ( ) are centimeters.
2. Fabricate from one foot of tube, copper, seamless ASTM-B-280-3/8.
3. Use two 3/8 copper male fittings.

Figure F-1. Filter-Dryer By-Pass Assembly.





DIAGRAMS

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IRING DIAGRAM.

he wiring diagram for the air conditioner is shown in Figure

REFRIGERANT SYSTEM DIAGRAM

he refrigerant system diagram for the air conditioner is shown in Figure F0-2.



COMPRESSOR - Compresses low pressure refrigerant vapor from the evaporator into high pressure, high temperature vapor.

CONDENSER - Cools the hot, high pressure refrigerant gas causing it to condense into high pressure liquid refrigerant.

CRACK CASE HEATER - Prevents migration of liquid refrigerant into the compressor in cold weather.

DEHUMIDIFIER - Cools and dehumidifies air before it enters the room.

DRIER - Removes any traces of moisture from the refrigerant system.

HEATER - Provides heat during cold weather operation.

HIGH PRESSURE CUTOUT - Interrupts power to the compressor when the refrigerant system pressure becomes too high.

EXPANSION LINE SOLENOID - Opens or closes the liquid refrigerant line from the condenser coil to the evaporator coil expansion valve.

BYPASS THERMAL EXPANSION VALVE - Injects liquid refrigerant into the recirculating gas in the bypass circuit to maintain the temperature of the gas below its extreme limit.

LOW PRESSURE CUTOUT - Interrupts power to the compressor when the refrigerant system pressure becomes too low.

SPEED CONTROL - A switch which automatically adjusts fan speed to compressor discharge pressure.

EQUALIZER SOLENOID - Opens or closes the pressure equalizing circuit from the discharge side of the compressor to the suction side.

LOW THERMAL EXPANSION VALVE - Meters liquid refrigerant into the evaporator coil distributor.

RESERVOIR - A reservoir for liquid refrigerant which tends to stabilize operation of the refrigeration system.

GROUNDING FILTER - A device that provides a low-resistance path to ground for stray currents, such as ignition and high frequency wiring.

TEST VALVES - Valves for suction and discharge when air conditioning refrigerant is being tested and serviced.

VIEWING GLASS - A diagnostic tool to observe refrigerant flow and refrigerant level.



**A**

ation, List of .....	1-6
er Control, Fresh .....	4-19
harge Grille .....	4-10
ter .....	4-18
ake Grille .....	4-11
een, Fresh .....	4-14
e, Relay (K4 and K5) .....	4-34
y .....	
g .....	6-2
nsor Fan .....	4-44.2
pan .....	4-23.1
Drain Tube .....	4-23.2
fier (CR1) .....	4-38
ilter .....	4-39
anel .....	4-9

**B**

ff Panel .....	4-21
----------------	------

**C**

Cover .....	4-8
ities and Features .....	1-8
Assembly .....	6-2
er .....	4-13
g the System .....	5-7
g Unpacked Equipment .....	4-3
Breaker .....	4-30
g Out the Refrigeration System After Burnout .....	5-10.2
lacement, Evaporator .....	5-23
sor .....	4-40, 5
sor Motor Burnout .....	5-10
sor Motor Burnout, Diagnosing .....	5-10.1
sor Motor Relay (K1) .....	4-32
sor Test .....	4-40.1
ate Drainage System .....	4-23
er Coil .....	4-42.4
er Coil Guard .....	4-15
er Coil Replacement .....	5-20
er Fan Assembly .....	4-44.2
er Fan Guard .....	4-16
Panel .....	4-24
ion to Remote Control .....	4-4.3
.....	1-13
se Heater .....	4-40.2

## D

Damper Control, Fresh Air .....  
 Debrazing .....  
 Delay Relay, Time (K3) .....  
 Destruction of Army Materiel to Prevent Enemy Use .....  
 Diagnosing Compressor Motor Burnout .....  
 Differences Between Models .....  
 Discharge Grille, Air .....  
 Discharge, System .....  
 Drain Tube Assembly, Lower .....  
 Drip Pan Assembly .....

## E

Elements, Heater .....  
 Eliminator, Mist .....  
 Equipment Data .....  
 Evacuating the System .....  
 Evaporator Coil .....  
 Evaporator Coil Replacement .....  
 Evaporator Fan .....  
 Expansion Valve, Thermal .....

## F

Fans and Motors .....  
 Fan, Condenser Assembly .....  
 Fan, Evaporator .....  
 Fan Motor .....  
 Fan Speed Switch (S8) .....  
 Filter, Air .....  
 Filter Assembly, RFI .....  
 Filter-Drier (Dehydrator) .....  
 Fresh Air Damper Control .....  
 Fresh Air Screen .....  
 Fuse Replacement .....

## G

General .....  
     Discription and Use of Operator's Controls and  
         Indicators .....  
     Direct Support Maintenance Instructions .....  
     General Support Maintenance Instructions .....  
     Lubrication Instructions .....  
     Maintenance Procedures .....  
     Preventive Maintenance Checks and Services (PMCS) .....  
     Operation Under Usual Conditions .....  
     Operation Under Ununusal Conditions .....

	Paragraph
ts, Special Tools, TMDE, and Support Equipment	4-1
Principles of Operation .....	1-12
ooting .....	3-2, 4-6,
	5-2

## H

.....	1-5
.....	1-15
.....	4-43
ckcase .....	4-40.2
nts .....	4-43.1
(K2) .....	4-31
ostat .....	4-43.2
.....	1-16
re Switch .....	4-41.1

## I

.....	4-4.1
Instructions.....	4-4
Plates .....	4-22
.....	6-3

## J

.....	4-28
-------	------

## L

.....	5-5
eviations .....	1-6
Description of Major Components .....	1-9
.....	1-15
Tube Assembly .....	4-23.2
.....	4-12

## M

Forms, Records and Reports .....	1-2
tor .....	4-20
t, Compressor .....	5-10
n .....	4-44
.....	4-44.3
t .....	4-17



## O

Operation in Dusty or Sandy Areas .....  
Operation in Extreme Cold .....  
Operation in Extreme Heat .....  
Operation Under Rainy or Humid Conditions .....  
Operation in Salt Water Area .....

## P

Pan Assembly, Drip .....  
Panel Assembly, Top .....  
Panel, Control .....  
Panel, Lower .....  
Power Source .....  
Preparation for Storage .....  
Pressure Control Switch (Fan Speed) .....  
Pressure Equalizer Solenoid Valve .....  
Pressure Regulating Valve .....  
Pressure Relief Valve .....  
Pressure Switches .....  
Pressure Switch, Hi/Lo .....  
Pressure Testing .....  
Purpose .....

## R

Receiver .....  
Receipt, Hand .....  
Receptacles .....  
Rectifier Assembly (CR1) .....  
RFI Filter Assembly .....  
Refrigerant Components .....  
Refrigerant Tubing .....  
Regulating Valve, Pressure .....  
Relay Armature (K4 and K5) .....  
Relay, Compressor Motor (K1) .....  
Relay, Heater (K2) .....  
Relay, Time Delay (K3) .....  
Relief Valve, Pressure .....  
Replacement  
    Condenser Coil.....  
    Fuse .....  
    Sight Glass .....  
    Solenoid Valve .....  
Reporting Equipment Improvement Recommendations .....  
Rotary Selector Switch (S1) .....

**S**

.....	1-1
sh Air .....	4-14
itch, Rotary (S1) .....	4-25
ves .....	5-19
.....	4-47
.....	4-42.3
Replacement .....	5-16
lve .....	4-42.1
lve, Pressure Equalizer .....	4-42.2
lve Replacement .....	5-14
er .....	4-4.2
tor .....	4-17
e Equipment .....	2-4
e Equipment .....	2-5
(S8) .....	4-27
ssure .....	4-41.1
Control (Fan Speed) .....	4-41.2
Switches .....	4-41, 5-11
the System .....	5-7
g the System .....	5-6
scharge .....	5-3

**T**

Control and Thermostat (S2) .....	4-26
ards (TB1 and TB2) .....	4-36
.....	4-40.1
.....	5-5
.....	5-8
ansion Valve .....	5-22
Relay, (K3) .....	4-33
(T1) .....	4-35

**U**

.....	4-2
-------	-----

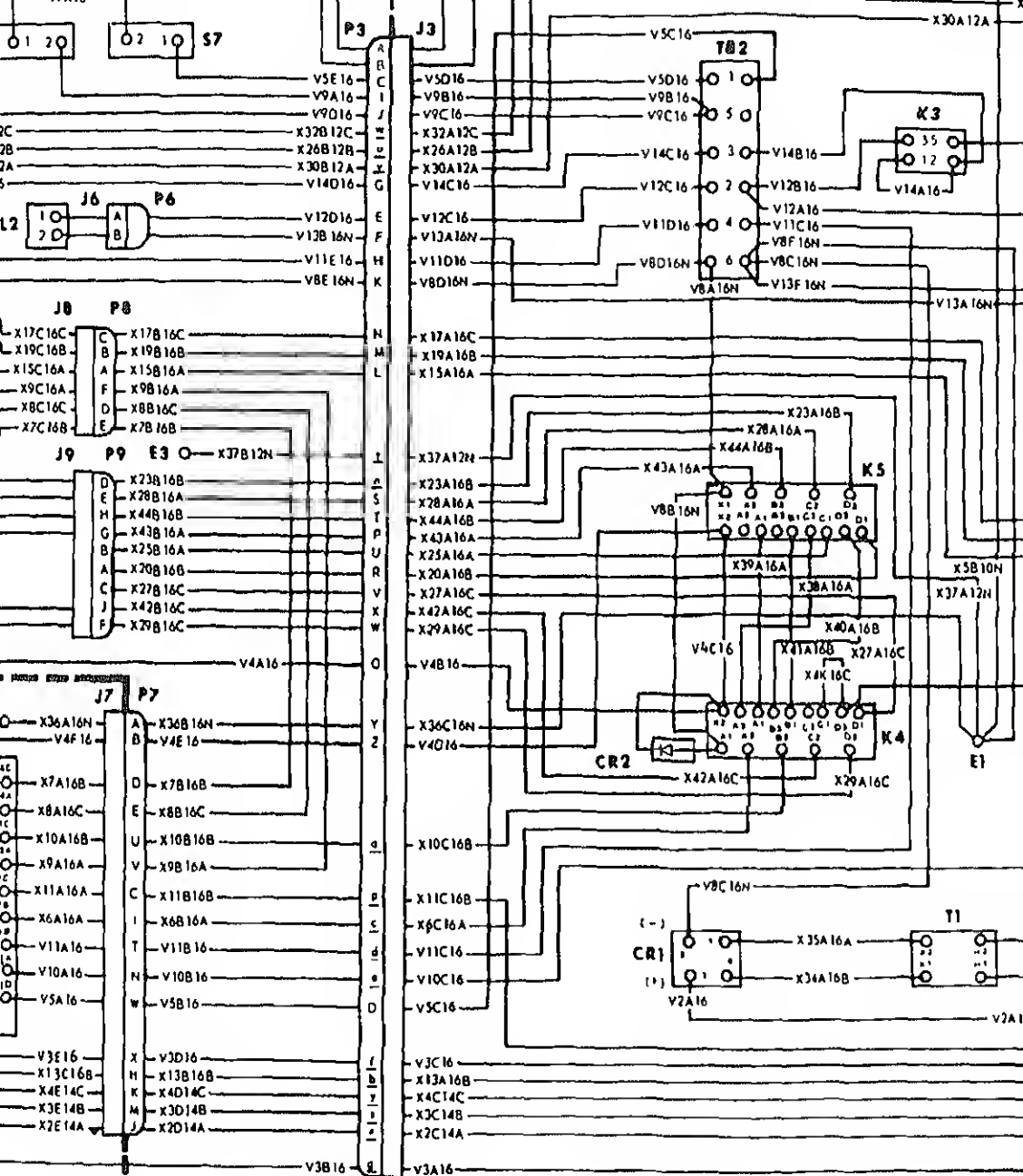
## **V**

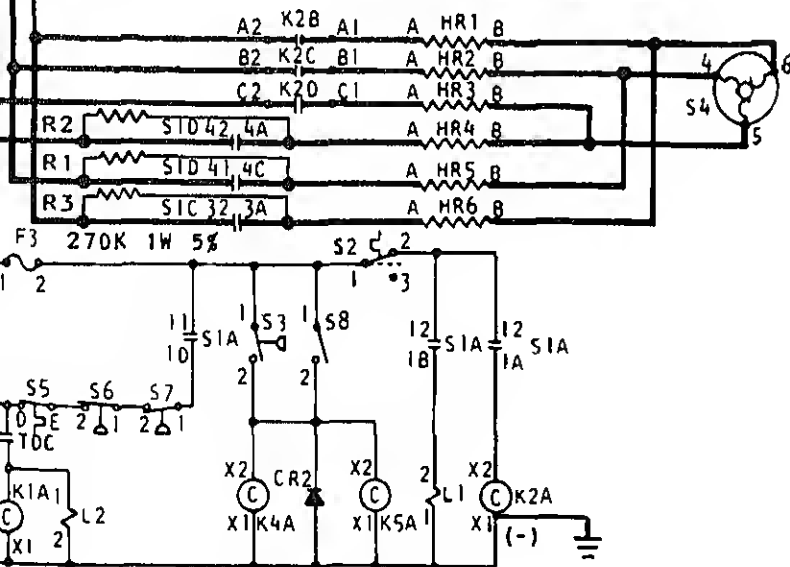
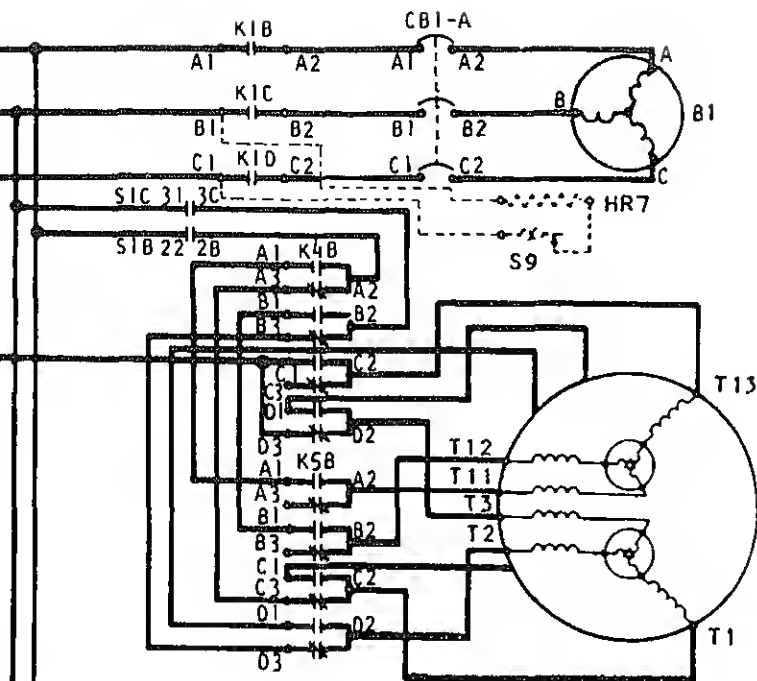
### Valves

Pressure Equalizer Solenoid .....	
Pressure Regulating .....	
Pressure Relief .....	
Service .....	
Solenoid .....	
Thermal Expansion .....	
Ventilate .....	

## **W**

Wire Leads and Wiring Harness .....	
-------------------------------------	--





1. T
2. P
3. I
- A
4. S
- T
- 2
5. C
- R

SELECTOR SWITCH -S1- POSITION	
1	
2	
3	
4	
5	



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PUBLICATION TITLE

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PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
1		4-3	
5	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine is 6 Cylinders. The engine on my set only has 4 Cylinders. Change the manual to show 4 Cylinders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim. Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2 910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN.

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